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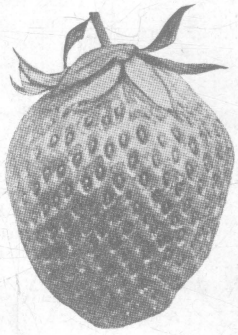
The Home Fruit Garden

By The Late

Frank H. Beach

Extension Horticulturist, the Ohio State University



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Index

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TABLES

SPRAYING PROGRAMS

DUSTING PROGRAMS

THE HOME FRUIT GARDEN

By the Late
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Growing fruit at home is an interesting hobby. A properly planned and managed home fruit garden will supply a wide variety of small and tree fruits that might not be purchased. One can harvest fresh fruits in season, beginning with strawberries in June and continuing with cherries, currants, raspberries, blueberries, peaches, plums and grapes, and ending with pears and fall apples. Home-grown fruits can be used and enjoyed when fully ripened and deliciously flavored. In addition to the fruits used fresh, considerable quantities can be canned, frozen, dried, or used for making jellies, butters, preserves, juices, and many other fruit products.

The success of a home fruit garden involves a careful plan, using the kinds of fruits adapted to the location. *They should be chosen to provide the amounts actually needed.* The chief mistake in the past has been to plant too much. Over-ambitious plantings require too much work, are usually neglected, and the yield and quality of the fruit are both disappointing. The day has long since passed when plants and trees can be planted and satisfactory fruit harvested without good cultural care. It is now essential to protect the trees and plants from an increasing number of diseases and insect pests with proper spraying or dusting, followed with needed pruning, fertilization, soil management, and other necessary practices.

Fruits are healthful. They belong to a group of so-called protective foods—namely, fruits, vegetables, milk and eggs, around which diets should be planned. Fruits contain many body-building minerals and vitamins and provide bulk and pectin which medical authorities proclaim highly essential in good intestinal hygiene. Home economists recommend at least two good servings of fruit a day for the average adult, one of which is high in vitamin C, as fresh strawberries. Yellow fleshed fruits, such as yellow peaches, are sources of vitamin A. Likewise, the fruit sugars are valuable as energy foods.

Arrangement of Fruit in the Home Garden

Every gardener has individual tastes for certain fruits and varieties of fruits. No two sites for the fruit garden will be the same. Therefore, you will need to devise your own planting plan. As a guide, a sample plan is shown in Figure 1, which includes dwarf apple trees, since they are preferred in the backyard to large standard trees which are difficult to spray and manage.

If a fence encloses the fruit garden, grapes can be grown, one vine at each post. Thus, the space devoted to grapes in Figure 1 could be planted to raspberries, or to another desired fruit. If sweet cherries or additional plum and

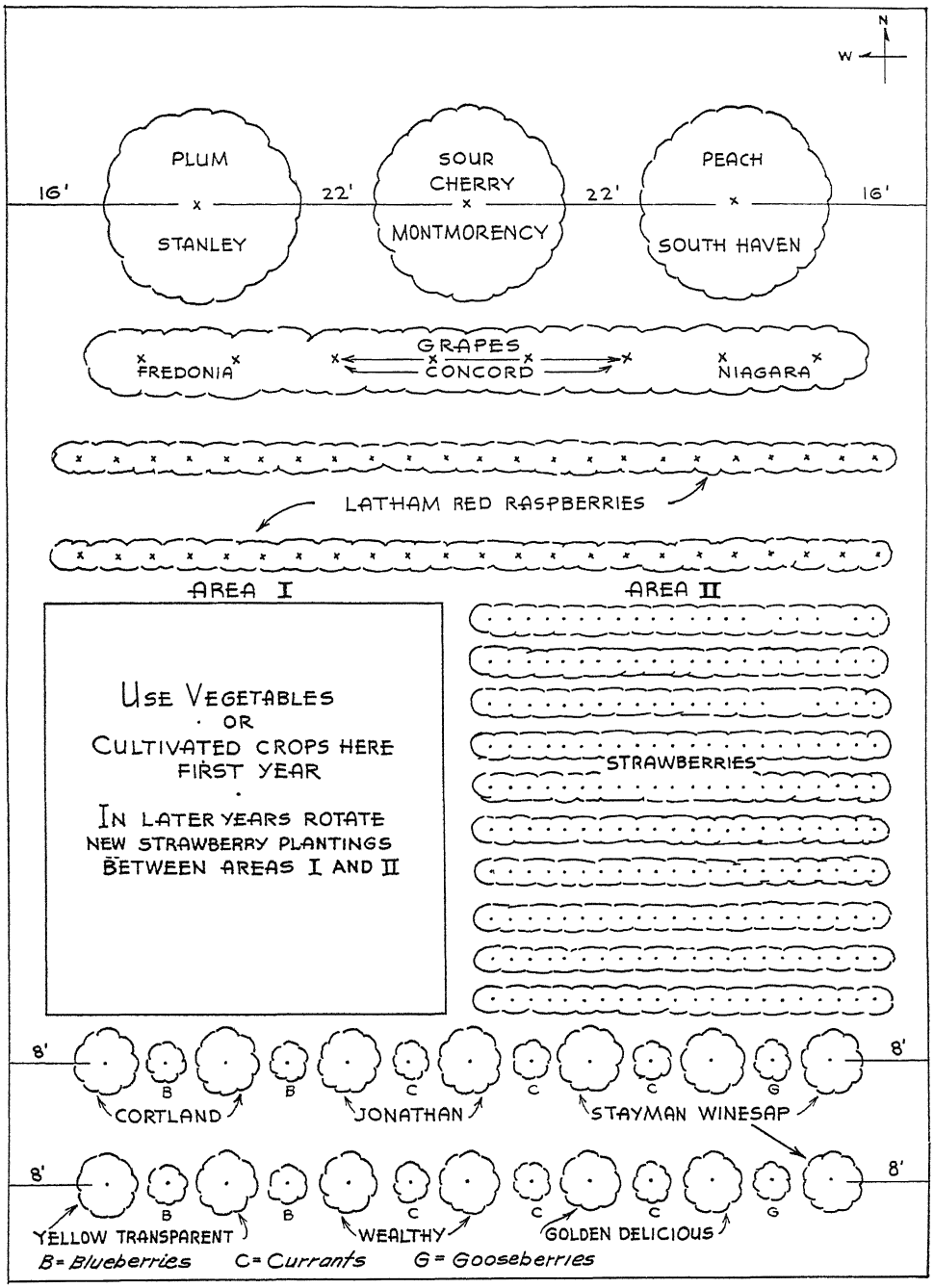

Fig. 1.—Plan for a home fruit garden, using dwarf apples. Scale: $\frac{1}{16}'' = 1'$.

TABLE I.—PLANTING DISTANCE, TIME INTERVAL FROM PLANTING TO FRUITING, APPROXIMATE YIELD, AND RIPENING DATES OF FRUITS AND NUTS GROWN IN OHIO

FRUIT	Approximate distance between rows *(Feet)*	Approximate distance between plants in the row *(Feet)*	Time interval from planting to fruiting *(Years)*	Annual yield per plant*	Annual yield for garden in Figure 1	Seasonal ripening periods**
SMALL FRUITS						
Blackberries	8	3	2	1¼ qts.		July-August
Blueberries	8	4	2	4 qts.	20 qts.	July
Boysenberries***	8	6	2	1¼ qts.		July
Currants (hedgerow)	8	4	3	3 qts.	15 qts.	July
Dewberries (hills)	5	5	2	1 qt.		July
Grapes	8	8	3–4	6–10 lbs.		September
Gooseberries (hedgerow)	8	3	3	3 qts.	6 qts.	July
Raspberries	8	3	2	1½ qts.	65 qts.	June-July
Strawberries	3½	1½	2	¾ qt.	150 qts.	June
Youngberries	8	6	2	1¼ qts.		July-August
TREE FRUITS						
Apples—Dwarf	10	10	2–3	¼–½ bu.	10 bu	July-October
Semi-Dwarf	15	15	4–6	2–4 bu.		
Standard	40	40	6–10	5–10 bu.		
Apricots***	22	22	4			July-August
Cherries—Sour	22	22	4–6	1–2 bu.	1½ bu.	July
Sweet	30	30	6–8	1–2 bu.		June-July
Nectarines***	22	22	3–4	1–2 bu.		August
Nuts****						
Filberts	18	18	4–5	1 gal.		September
English Walnuts	40	40	10–15	1–2 bu.		September
Black Walnuts	50	50	6–8	½–2 bu.		October
Hickory	40	40	10–15	1 gal.–1 peck		September
Pecans	50	50	5–7	½ gal.–1 peck		September-October
Chestnuts (Chinese)	40	40	10–12	3 gals.		September-October
Peaches	22	22	3–4	1–2 bu.	1½ bu.	August-September
Pears—Dwarf	10	10	3–4	¼–½ bu.		August-October
Standard	20	20	6–8	1–3 bu.		
Plums	22	22	5–8	1–2 bu.	1½ bu.	September
Quinces	15	15	5–8	½–1 bu.		September-October

* Yield varies with age and size of plant and growing conditions.

** Based upon ripening dates at Wooster, Ohio, which are about one week in advance of northern Ohio, one week after central Ohio, and three weeks after southern Ohio

*** These fruits may not be satisfactory under Ohio conditions (see Section on variety recommendations).

**** Most nut trees do not bear significant crops before about 10 years Grafted trees usually bear at a younger age than seedling trees

peach trees are desired, the planting could be extended to the north, using spacing distances as recommended in Table I. If pear trees are used, preferably the dwarf size, they, too, should be located on the north side, as far from the apples as possible to avoid transfer of fire blight, a disease which both fruits can contract, but which is most damaging to the pear. The tall trees are placed on the north side of the garden to prevent shading of the small fruits.

It is probable that the plan suggested in Figure 1 cannot be followed exactly. Therefore, the data given in Table I will be of value in planning a home fruit garden to suit individual tastes and circumstances. The fruit yield for the garden in Figure 1 should supply the needs of an average family of four or five with fresh, canned, dried, and frozen fruits. It should be stressed again, that you plant only the amount of fruits you will have time to tend properly. Additional fruits can be purchased.

Recommended Varieties With Pollination Requirements*

The beautiful display of fruits in nursery catalogues may influence you to plant an excess of varieties not particularly adapted to your region, or which are not the best producers. The varieties recommended in the following list include those considered on the basis of experience to be the most satisfactory for the home fruit gardener in Ohio. Included after each variety are code numbers which indicate its best uses. The code is as follows:

Dessert—eating raw 1	Preserves 4	Freezing 7
Canning 2	Culinary 5	Drying 8
Jelly 3	Juice 6	

Apples

Yellow Transparent.—This is one of the earliest varieties, adapted to all sections of Ohio, comes into bearing at an early age, tends to bear many small fruits in alternate years if not hand thinned in heavy crop years. Tree is relatively small. Fruit is excellent for sauce and cooking. 60 to 70 days (July 22)**, 2-5-8.

Wealthy.—It is adapted to all parts of Ohio, may bear crops in 5 years after planting, and is one of the smaller trees at maturity. Fruit is medium sized, tart, attractively striped with red, good quality, and excellent for culinary uses. 110 to 115 days (September 1), 3-5-8.

Cortland.—The trees are vigorous and productive, and come into bearing at an early age. Fruit is a deep red, attractively covered with purplish bloom, and is an excellent eating and cooking apple. Flesh is white, crisp, tender, aromatic and does not darken quickly when cut for salads. 135 to 145 days. (September 10), 1-5-6.

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* Detailed information on fruit varieties in Ohio can be secured from "Fruit Varieties in Ohio," by Ellenwood, Havis, and Howlett. Ohio Agr. Exp. Sta. Bul. 627, 1942.

A number of varieties can be budded or grafted on a single tree. Grafting and Budding Fruit Trees, Lewis, I. P. Ohio Agr. Exp. Sta. Bul. 510, 1932.

** Average number of days required for maturity from full bloom to harvest and average date of picking at Wooster, Ohio.

Jonathan.—A popular autumn and early winter red apple, excellent for eating, flesh whitish yellow, crisp, tender, very juicy, sprightly sub-acid, high flavor, distinctive aroma, and holds firm in cooking. 140 to 150 days (October 6), 1-2-3-5-6-7-8.

Delicious.—An excellent popular red-striped autumn and winter eating apple which has distinctive aroma. It requires an adjacent cross-pollinating variety such as Jonathan. Fruit is large, tapering conic, often with five points surrounding the blossom end. Flesh is yellowish, fine-textured, very crisp, tender, juicy with mild aromatic flavor, but becomes mealy soon after harvest unless given prompt cold storage. About 150 days. (October 9), 1-6-8.

Golden Delicious.—This is the most popular yellow eating apple. Tree comes into bearing early. Fruit must be hand-thinned in heavy crop years. Flesh is yellow, crisp, very tender, rich with pleasing mild flavor. Flesh does not darken quickly when cut for salads. Skin is very thin and fruit apt to shrivel if kept for long out of proper cold storage. Keep in refrigerator to retain best eating quality. 160 to 165 days (October 20), 1-2-4-5-6-7-8.

Stayman Winesap.—This is a very popular, all-purpose red-striped, late fall and winter apple with yellow flesh, rich full-flavored, juicy, splendid for eating and unexcelled for all cooking purposes. It should be planted with another variety, such as Jonathan and Wealthy, in order to provide for cross-pollination. 165 to 170 days (October 22), 1-2-5-6-7-8.

Crabapples.—The Dolgo, beautiful in blossom, and with brilliant crimson fruits ripening in August, and Hyslop, with attractive red fruits in September, are satisfactory varieties. 2-3-4-5.

Apricots

Apricots are not well adapted to Ohio conditions because the blossoms open early and the prospective crop is often destroyed by late spring frosts. Where sites are known to be particularly free from frost injury, Breda and Harris varieties may be tried.

Sour Cherries

Montmorency.—This is the most widely grown and the leading sour cherry for culinary purposes, principally pies. Its fruits are large and of good quality, and the trees are vigorous and productive. (July 13), 2-4-5-6-7.

Duke Cherries

The Duke cherries, whose characteristics grade between those of sour and sweet varieties, are best suited to the home fruit garden and are especially desirable for home pie making. They are cross pollinated by both sweet and sour cherry varieties whose blossoming season overlaps.

Reine Hortense.—Fruit large, light red in color and matures over a rather long season. Rather tart for a Duke. (July 10), 2-4-5-6-7.

Brassington.—Tree medium size and not very vigorous. Cherries of good size, mild and of excellent quality. Quite productive. (July 10), 2-4-5-6-7.

Sweet Cherries

All sweet cherries require cross-pollination. Use at least two varieties of sweet cherries with Windsor for one of them.

Schmidt.—Fruit has a purplish black skin, firm dark flesh, large size, and of excellent quality. (July 5), 1-2-4-7-8.

Napoleon (Royal Ann).—Fruit has firm, crisp flesh, a bright red over a yellowish under cover, colorless juice, sweet, and of very good quality. Fruit may be subject to rotting if not well sprayed. Trees are vigorous, productive, and relatively hardy. (July 3), 1-2-4-7-8.

Windsor.—This is the most widely planted sweet cherry in Ohio. The skin is dark red, flesh is firm and the trees are very productive. Fruits are not subject to cracking. Trees are fairly hardy and long-lived. (July 5). 1-3-4-7-8.

Nectarines

The nectarine is a fuzzless peach which, due to the lack of fuzz, is more susceptible to attack by curculio. Varieties suggested for trial under Ohio conditions are Hunter and Sure Crop. Nectarine varieties are quite susceptible to winter injury and spring frost damage.

Peaches

Erly-Red-Fre.—Promising very early white-fleshed freestone. Large, productive, bright red, ripening about two weeks before Golden Jubilee and Cumberland.

Golden Jubilee.—This is the earliest widely planted peach in Ohio. It is of high quality, yellow freestone, large roundish oblong shape and similar to Elberta in appearance but superior in quality. (August 15), 1-2-4-6-7-8.

Rochester.—The fruit is of medium size, round, fuzzy, with deep red mottling over-color and yellow under-color. Flesh is yellow, stained with red at pit. It is of very good quality and excellent for home canning. Stone is small and free. The variety must be hand thinned in heavy crop years to attain satisfactory size and more regular production. (August 19), 1-2-4-5-7-8.

South Haven.—Fruit is medium in size, round, moderately firm, yellow fleshed, very good quality, splendid for home canning and entirely freestone most seasons. Fruit buds are quite winter hardy, making it one of the most reliable varieties. (August 25), 1-2-4-5-7-8.

Halehaven.—This variety is an attractive yellow freestone, of good size and quality, is rapidly increasing in popularity. It carries more color, ripens more uniformly, and the flesh is firmer and richer than South Haven, though perhaps not quite as hardy in fruit bud. (August 25), 1-2-4-5-7-8.

Elberta.—This is the leading commercial variety for Ohio. Fruit is large, roundish, oblong, greenish to lemon yellow ground color, overspread and mottled with various shades of red. Flesh is yellow (red near pit); firm, juicy, somewhat stringy, with freestone. Blossom buds are frequently killed by low winter temperatures. Fruit is of fair quality when tree ripened. (September 9), 1-2-4-5-7-8.

Cumberland.—This white-fleshed variety is hardy, early, and very freestone; fruit is medium to large and the flesh is firmer and of better quality and now preferred to Carman, an old favorite, hardy, white-fleshed freestone variety. (August 14), 1-5.

Belle of Georgia.—This is a hardy, white-fleshed, freestone peach, of medium size and good quality with firm flesh and splendid for canning. (September 1), 1-2-4-5-7.

White Hale.—This is an excellent quality, white freestone variety, worthy of trial in the home garden. (September 10), 1-2-4-5-7.

Pears

Bartlett.—This is the leading pear variety in Ohio. It is splendid for eating, excellent for canning. Fruit medium to large, clear yellow in color, often with a faint blush. Flesh is fine-grained, buttery, very juicy, aromatic, and of good quality. The tree is susceptible to blight disease and is best top-worked in the orchard on Old Home, a blight resistant understock variety now available at some nurseries. Kieffer also can be used as an understock. Plant at least one other variety, such as Duchess, for cross-pollination. (September 1), 1-2-4-5-8.

Duchess.—Cross pollinates Bartlett. Productive, fruits large to very large, somewhat coarse. Best for culinary purposes and canning. Best as a dwarf tree. About September 10.

Seckel.—This is a small sweet pear of excellent dessert quality, which is yellowish-brown, greenish-yellow, marked with pale russet and often a lively russet red cheek. The flesh is yellowish-white, buttery, very juicy, sweet with rich aromatic spicy flavor, and best in quality. Seckel is relatively resistant to blight. Does not cross-pollinate Bartlett. It may be pickled or spiced. (September 20 to 25), 1-2.

Kieffer.—The variety is seldom killed by blight anywhere in Ohio. It is a dependable cropper. When properly picked and ripened, Kieffer is satisfactory for canning and culinary uses.

Plums

The Japanese plums, examples of which are Abundance, Santa Rosa, Elephant Heart, and Burbank, blossom early in the spring and are susceptible to spring frost damage under Ohio conditions. All Japanese plums are benefitted by cross pollination by one or more other varieties of this species. They are more susceptible to brown rot than the European type of plum, but they are fine for eating out of hand. It is doubtful, however, that the home gardener will be satisfied with yields of Japanese varieties, and it is recommended that he spend most time with the European sorts as follows:

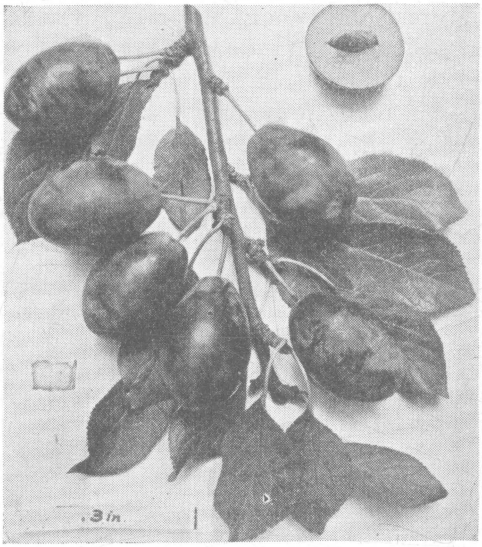

Fig. 2.—The Stanley prune is recommended for the home fruit garden.

Stanley Prune.—This prune is becoming increasingly popular. It is blue, medium-sized, excellent for canning and of very good quality (see Fig. 2). Trees are very hardy and begin to bear well at 4 or 5 years from planting. (September 11), 1-2-3-4-5.

Imperial Epineuse.—This is a large reddish-purple plum of excellent quality, semi-freestone and often does not reach bearing age until about 10 years. It is a long-lived tree. (September 10), 1-2-3-4-5-8.

Shropshire Damson.—This is the preferred Damson for Ohio. Trees are vigorous and long-lived and produce consistently high yields. It is splendid for jam and culinary uses. The fruits are small and blue, with sprightly tart flavor. (September 25), 4-5.

Reine Claude.—This is a high quality dessert and canning plum. Fruit is greenish yellow, round, medium in size, and semi-freestone. (October 6), 1-2-3-4-5-8.

Bradshaw.—Ripens about a week before Stanley and is a productive reddish purple variety. *Arch Duke* and *Grand Duke*, ripening a week or two after Stanley, are large, firm, purplish blue plums. All these varieties lack high dessert quality but are productive and quite satisfactory for canning.

Persimmons

The native persimmon is hardy throughout Ohio. The tree is medium to large, long-lived and makes an attractive ornamental. It has a large tap root

and should be transplanted as recommended for nut trees on page 53. There are several varieties, among which are Josephine (largely seedless), Early Golden, Lambert, and Buhrman which are offered by some nut tree nurseries. The tree and fruit are relatively resistant to insects and diseases. It is wise to plant at least two varieties to insure pollination, since some trees may have both male and female flowers while others may have the male flowers on one tree and the female on another.

Quinces

The quince has limitations in Ohio as it is susceptible to fire blight disease, Oriental fruit moth, curculio, and black rot. Hence, quinces are relatively hard to grow. Their use is restricted to jellies, marmalades, preserves, and to flavoring baked or stewed apples and pears. *Orange* variety is the more common, having yellow flesh of very good quality. It ripens earlier in autumn than *Champion,* which is a pear-shaped quince, larger in size and a lively yellow when ripe.

Nuts

The heartnut, Japanese walnut, pecan, Hican, and butternut are not entirely satisfactory under Ohio conditions. The butternut is susceptible to a fungous disease and is relatively short lived. The heartnut is tender to cold, and the pecan often fails to mature its nuts properly. The Japanese walnut makes an attractive tree but may kill wholly or partially as a result of winter injury.

Regardless of genera, species, or variety it is wise to provide for cross-pollination by planting two or more varieties of each nut. Experimental evidence on self-fruitfulness of nuts is not adequate for recommending the planting of a single variety.

Nuts which are satisfactory under Ohio conditions are:

Black Walnuts.—In general, the *Thomas* variety has proven satisfactory. The nuts are large and have good cracking qualities. *Ohio, Stabler,* and *Elmer Myers* also are good varieties which are propagated by most nurserymen who grow nut trees.

Chestnuts.—One takes the chance of chestnuts blighting. Hybrids between Chinese and Japanese chestnuts, although not entirely immune to blight, are proving highly resistant. Those varieties showing promise are: *Carr, Hobson, Abundance, Stoke, Reliable,* and *Yankee.* Many of the nuts are fully as sweet as the native chestnut and considerably larger. Most chestnuts are susceptible to cold injury at temperatures about 25°F. below zero.

English Walnuts (Persian Walnuts).—This nut is susceptible to winter killing at temperatures between —10°F. and —20°F. They should be planted on

sites especially adapted to peaches, and grown slowly to prevent winter injury insofar as possible. *Franquette* and *Mayette* are among the more successful varieties in Ohio. Both varieties should be planted together to provide for cross-pollination.

Filberts.—Hardiness is a problem with this nut. Among the newer, more hardy varieties are *Cosford* and *Medium Long. Italian Red* also is hardy and among the more productive varieties. Hybrids between American and European filberts are worthy of trial. *Rush* and *Winkler* are shrub-like, hybrid filberts which are hardy, productive, and bear large nuts. *Bixby* and *Buchanan* also are promising hybrids. The Barcelona has attractive nuts but the tree is lacking in vigor, not so productive and susceptible to winter injury.

Hickory.—Varieties should be selected for Ohio which mature their nuts. The *Hagen, Mann, Miller, Neilson, Stratford,* and *Weschcke* are varieties which have originated sufficiently far north to be promising under Ohio conditions. The Kentucky variety matures its nuts and yields moderately well. *Fairbanks* and *Anthony* have been satisfactory in most instances.

Pecan.—Occasional crops of fair nuts may be expected from the pecan in central Ohio but rarely in the northern section. In southern Ohio more regular crops are obtained. Only the hardy varieties should be selected, such as *Greenriver, Busseron, Posey* and *Major.* The tree is an attractive ornamental, succeeding best on very fertile, well drained soils.

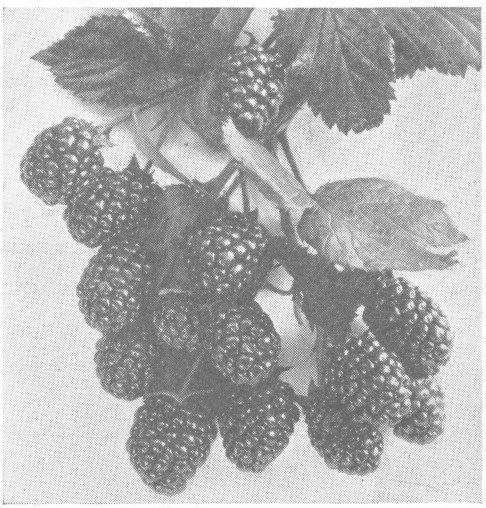

Fig. 3.—The Eldorado blackberry is adapted to the home fruit garden. The fruit ripens after raspberries.

Blackberries

Eldorado.—This is the most widely planted variety in Ohio. The fruits are glossy, attractive, and fairly large (see Fig. 3); the canes are vigorous and strong; and the plants are productive. (July 6), 1-2-3-4-5-6-7-8.

Boysenberries

Berries are of high quality but somewhat acid if not picked exactly on time. Fruit is extremely large. Canes are susceptible to crown gall and to killing by cold temperature. Canes require winter protection. Should only be grown in a limited way, (July 1), 1-2-5-6-7.

Currants

Wilder.—This is the most popular currant in Ohio, good quality, long compact clusters, and the bushes are vigorous and productive. Berries are large, bright red, and attractive. (June 20), 3-4.

Red Lake.—This variety has large clustered berries (see Fig. 4), good quality. The plants are vigorous, strong, and usually more productive than Wilder. The variety is gaining prominence over Wilder where earliness is not of special importance. (June 15), 3-4.

English Black currant varieties are prohibited by state regulations because the fruits are susceptible to white pine blister rust and are the hosts to its transmission to the white pine. The American black currant varieties, such as Crandall, are not subject to these restrictions nor are the red varieties.

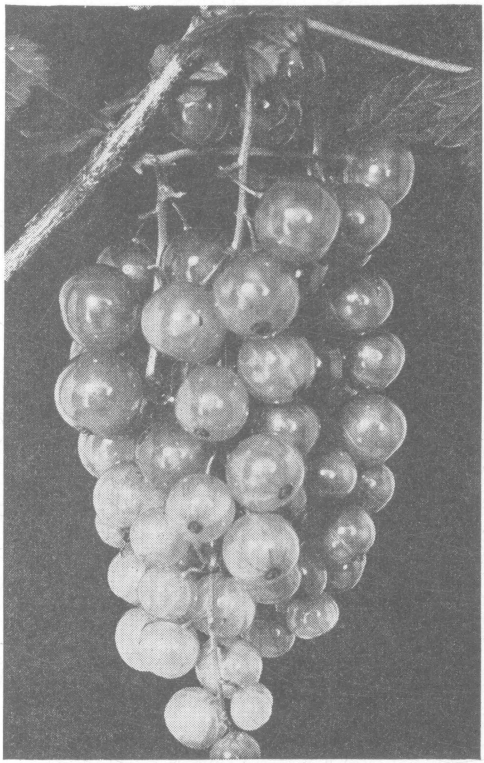

Fig. 4.—The Red Lake variety of currant is gaining favor. It is recommended for the home fruit garden.

Dewberries

Lucretia.—This is a trailing plant, which requires staking or trellising. Fruits are large, sweet, bright, glossy, black, with soft flesh. (July 3), 1-2-3-4-5-6-7.

Grapes

Fredonia (Blue).—The fruit is similar to Concord, but ripens earlier. The vines are hardy, relatively easy to grow, and highly productive with large compact bunches. (September 10), 1-3-4-5-6.

Niagara (White).—This is the leading white grape in Ohio. Bunches are large. Berries are of good size and splendid quality. The vines are vigorous and hardy. (September 20), 1-3-4-5-6.

Concord (Blue).—This is the most widely planted grape in Ohio, very hardy, highly productive, berries are firm and good for table and excellent for juice. (September 20), 1-3-4-5-6.

Delaware (Red).—The bunches and berries are small but the fruit has excellent dessert and juice qualities. It succeeds only with good culture. (September 20), 1-3-4-5-6.

Captivator (Red).—The vine is fairly hardy. The fruit is of excellent quality but the bunches often lack compactness. (September 20). 1-3-4-5-6.

Concord Seedless (Blue).—This is a new variety and worthy of testing in a home garden, particularly where berries are desired for canning. They are practically free from seed. (September 20), 1-3-4-5-6.

Gooseberries

Downing.—This is a standard green-colored gooseberry; plants vigorous and highly productive; fruit of medium size with thin skin and of excellent quality. (July 1), 2-3-4-5-7.

Poorman.—This is a very high quality standard red gooseberry which is large and attractive (see Fig. 5) with plants vigorous and high yielding. They are good for eating out of hand when dead ripe. (June 25), 1-2-3-4-5-7.

Raspberries

Latham (Red).—This variety is most widely planted in Ohio. It is highly productive, hardy, relatively easy to grow, and resistant to virus diseases. Berries are large, firm, and fairly good quality. Fruiting season is long. (July 7), 1-2-3-4-5-6-7.

Taylor (Red).—This variety ripens with Latham but is larger and better quality. A promising new variety. Quite disease resistant but not very hardy.

Indian Summer (Red Everbearing).—This variety bears one crop early in the season and another smaller crop before frost. Fruit is as large for the fall season as for spring, of good quality, but fairly soft. Plants are vigorous and relatively easy to grow. (June 28, with fall crop in September), 1-2-3-4-5-6-7.

Cumberland (Black).—Black raspberries should be planted 300 feet or as far as possible from red raspberries in order to prevent transfer of virus diseases from the reds. Berries are attractive, glossy, large, firm, and of good quality. Plants are vigorous and productive, but are relatively susceptible to anthracnose and to virus diseases. (July 1), 1-2-3-4-5-6-7-8.

Sodus (Purple).—Purple raspberries should be planted 300 feet from the red raspberries to prevent transfer of the virus disease, mosaic. Plants are extremely vigorous and productive but susceptible to mosaic. Fruit is large, light purple in color, high quality, and adapted to canning. (July 11), 2-3-4-5-7-8.

Strawberries

Premier (Howard 17).—This is the most widely planted and successful commercial variety in Ohio. Berry is medium to large, conic to long-conic in shape, firm and of deep red color. Quality is good. Plants are vigorous, relatively

resistant to frost damage, exceptionally free from foliage diseases, productive, and early in season. Fruiting season is long. (June 8), 1-2-4-5-6-7.

Fairfax.—The variety is of excellent dessert quality with large size berries, but plants are not so productive as Premier. Berries are dull red and may turn dark after picking, even though still firm. Fairfax is especially suited to the home garden. (June 8), 1-2-4-5-6-7.

Catskill.—Berries are large, roughly round conic, bright attractive red, flesh medium firm, and very good quality. A productive variety which ripens the latter part of Premier season. (June 10), 1-2-4-5-6-7.

Fig. 5.—The Poorman gooseberry is excellent for the home garden.

Other Varieties.—Midland, ripening in early mid-season, is a promising new variety, higher in quality than Premier. Sparkle is a very promising late mid-season variety showing considerable resistance to red stele root rot disease. Berry is bright red color, good size and high quality, especially for freezing. Aberdeen, Pathfinder and Temple are other varieties for trial showing red stele resistance. Chesapeake and Redstar are large, high quality, late ripening varieties, but lack productiveness and somewhat susceptible to disease.

Everbearing Strawberries

For late summer and fall berries which succeed best under a thorough system of mulching and irrigation the Gem is outstanding for Ohio. Gemzata is also good and Streamliner is suggested for trial. Green Mountain is a splendid everbearing variety, producing a large crop of high quality berries in June, but during the fall Gem is more productive and better quality.

Cabot.—Bush low, spreading, requiring rather heavy pruning for largest best quality berries. Ripens in late June. Other promising early varieties are Rancocas, Weymouth and June.

Concord.—Bush spreading, productive with large fruits of good quality ripening about mid-July. Other promising mid-season varieties are Stanley and Pioneer.

Jersey.—At present the most popular variety tested in Ohio. Bush semi-erect, very vigorous, productive with large firm fruits. Ripens about July 20. Other promising late varieties are Wareham, Atlantic, Pemberton and Burlington.

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Buying Plants and Care Before Planting

It is wise to plan the home fruit garden early, preferably in the fall, and notify the nurserymen to ship the plants about the first of April. This insures punctual delivery of the better grade stock. If desired, tree fruits can be successfully planted in the late fall, but small fruits are best planted in the early spring. Preference should be given to reliable local nurseries where transportation charges are less and adjustments for faulty stock can easily be made. Often it is possible to make a personal selection of stock in the nursery row. It pays to buy the better grade, larger plants. The following specifications are suggested:

Standard Apple and Pear Trees.—Vigorous, 4 to 7 foot, 1-year trees, or 5 to 7 foot, 2-year trees, about ¾ inch in diameter, and well branched. For pear varieties susceptible to blight, request Old Home blight resistant understock. (See variety recommendations for pears, p. 9).

Dwarf Trees.—Two-year trees which are well branched and have relatively vigorous root systems.

Cherries (Sour).—Sturdy, 1-year trees, 4 to 5 feet high, or 2-year branched trees, 4 to 6 feet with diameter of ⅝ inch or more.

Cherries (Sweet).—Select trees budded on Mazzard stock. Sturdy 1-year whips, 4 to 5 feet; or, 2-year trees of 5 to 7 feet and diameter of about ¾ inch.

Nuts.—One- or 2-year grafted stock, large size. If the tap root has been severed about 18 inches below ground a year before transplanting, more vigorous roots will have developed, which is desirable. Some nurserymen perform this root pruning as standard practice for nuts. Trees which are shipped with a ball of earth about the roots are more likely to succeed in transplanting.

Peaches, Apricots, Nectarines.—Vigorous, 3 to 4 foot, yearling trees of ½ inch diameter or more. Avoid large, older trees or small 1-year weak trees.

Plums.—Vigorous 1-year whips, 4 to 6 feet, or 2-year branched trees, 4 to 5 feet high.

Quince.—Request 2-year trees, 4 to 5 feet high, with a trunk diameter of ½ inch or more.

Blackberries, Boysenberries, Dewberries, Raspberries.—Specify No. 1 grade State inspected stock with vigorous root systems.

Blueberries.—Vigorous 2-year plants.

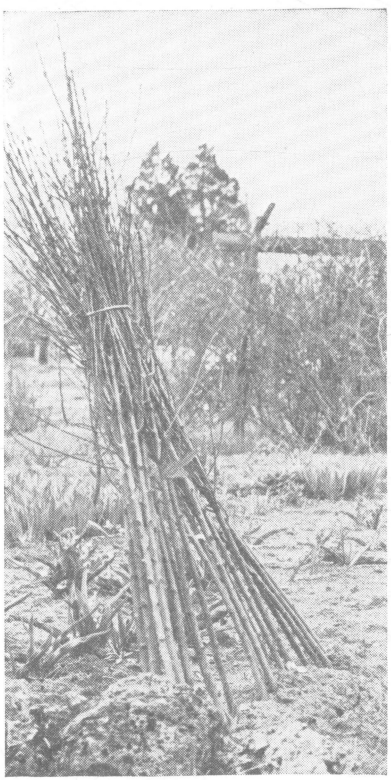

Fig. 6.—As soon as trees or plants arrive from the nursery they should be heeled-in and leaned toward the southwest. Be sure the soil is well drained and firmly packed about the roots.

Currants and Gooseberries.—No. 1 grade, 1-year plants with vigorous root systems.

Grapes.—No. 1 grade, 1-year plants.

Strawberries.—No. 1 grade, vigorous plants.

If the stock arrives before it is convenient to plant, the bundles should be opened immediately and the plants heeled-in on a well drained spot located on the north side of a building where it is cool. The trees should be separated and lined-out in a furrow deep enough to accommodate the roots (see Fig. 6). Likewise, small fruits such as grapes and strawberries should be temporarily set in a trench and dirt tamped gently around the roots.

As soon as the soil can be worked, the plants should be set permanently, shortly after the first of April, or perhaps in March if the weather permits. While planting, keep the roots of tree and small fruits continually moist by wrapping in wet burlap sacks or placing in a bucket of water. If the roots once become dry, the plants may grow poorly or die.

Preparation of Soil

If possible, the ground for both tree and small fruits should be plowed or spaded, either in the fall or spring before planting. Before planting, work the soil into a friable condition by discing or scratching with a hand cultivator. Ground which the previous year has been in cultivated crops or vegetables is best. If the plot has been in sod, the ground where strawberries are to be planted should be under cultivation at least a year before planting. This will help eliminate the white grub (see Fig. 7) which may destroy plants set on freshly plowed sodland. In the backyard it may not be desirable to plow the ground where fruit trees will be set; spading circular areas 3 feet in diameter will suffice.

Fig. 7.—The ground should be in clean cultivation for at least a year before planting strawberries. This helps destroy the white grub worms, shown above, which infest sodded areas.

Cultural Management of Small Fruits

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Strawberries

Planting.—Plant as early as possible before April 15 on well-drained, friable, fertile soil which has been in cultivation at least a year. Do not set plants with black or rotted roots. Remove all but one or two vigorous leaves from each plant, prune away about one-third of the root system (see Fig. 8), and plant so that the crown (where leaves arise) is level with the surface of the ground. If the crown is planted too deep and covered by soil, or left too shallow, the plants will do poorly or die. The initial plants for the home fruit garden can be purchased from the nursery, but in later years, plants for the new bed can be secured from the outside of the old matted rows. Select young plants with vigorous root systems and several leaves. They can be dug with a small hand trowel and transplanted immediately in early spring with but little root pruning. In transplanting, a handful of soil with which lead arsenate has been mixed (1 part lead arsenate to 20 parts soil), can be placed in each hole as plants are set. This protects against white grub injury for the life of the strawberry bed.

Soil Management.—Strawberries should be cultivated and hand hoed the first season to eliminate weed competition. Runner plants may be allowed to take root so that the width of each row will be about 2 feet, or, a foot on either side of the mother plants. To avoid winter injury to the crowns at temperatures lower than 15°F, strawberries should be mulched by about the

first of December, with 3 to 4 inches of clean wheat or rye straw, or shredded corn fodder. Select mulch material that does not pack tightly and smother the plants, and which is as free from weed seed as possible. If leaves or lawn clipping are used, apply lightly to prevent smothering.

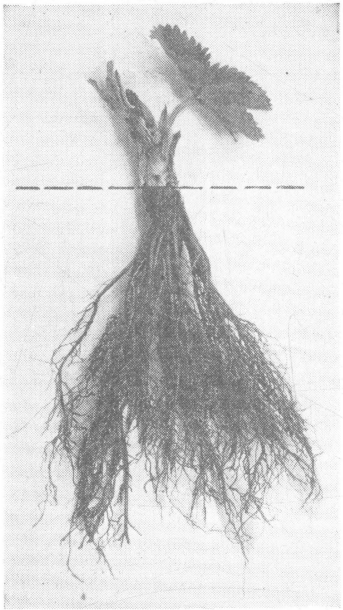

Fig. 8.—This strawberry plant is ready to set. Long roots have been shortened for convenience in planting. One healthy leaf remains, the others have been removed. Depth of planting is important and is indicated by the broken line.

Most of the mulch should be pulled away from over the plants into the middle of the rows the following spring after danger from frost is past and before the leaves show a whitish green. Maintain a good mulch between the rows and retain as much as possible around the plants in the row to conserve moisture and keep berries clean. The mulch will also help control weeds the fruiting year, but some hand weeding may be necessary to eliminate large weeds in the fruiting row.

Everbearing varieties, producing late summer and fall crop, such as Gem and Gemzata, are grown quite successfully over a heavy mulch of sawdust (2-3 inches) without need for winter protection over the mulch. Extra nitrogen fertilizer, such as nitrate of soda, placed around each plant and over the mulch, applied in late spring, may be needed to secure proper growth and green leaf color. Soil should be in good productive condition before planting.

Fertilization.—About a month after planting, the young plants should be fertilized with 2 tablespoons per plant of ammonium sulphate or a similar nitrogen carrying fertilizer. It is spread in a ring on the ground surface about 3 inches from the crown. Another identical fertilization can be made about mid-August, but care should be taken that the fertilizer does not come in contact with the leaves. Leaf burning may result if fertilizer is applied over plants wet with dew or rain. Nitrogen fertilizer in pellet form can be applied over the row when plants are dry; provided they are brushed immediately with a broom. Where available, a shovelful of well-rotted manure spread about the plant is excellent in place of the commercial fertilizer.

Deblossoming.—Blossoms which appear during the summer after planting should be removed weekly (see Fig. 9). Otherwise, they stunt the growth of the plants the first year and reduce yield the next. With newly planted everbearing varieties, the blossoms can be left for a fall crop after about July 1.

Irrigation.—Strawberries succeed best if irrigated. Irrigation assures a good plant row the first year and best yields the next year. Figure 10 shows the canvas ooze hose in position.

Furrow irrigation on either side of the row is satisfactory, making sure that the ground is soaked to a depth of 6 to 10 inches. One to two good irrigations a week are usually needed during dry periods. Yield and size of berries are greatly increased if the plants are irrigated preceding and during the picking season of the second year. This is particularly true if the season happens to be dry. Alternate row irrigation can be practiced in harvest season to reserve a dry path for picking.

The canvas ooze hose attached to the end of a garden hose is a good system for watering strawberries (see Fig. 10). Tramping on soaked soil is bad for the soil, and the wet ground is not conducive to pleasant or fast picking.

Fig. 9.—Strawberry blossoms should be removed during the summer after planting. If plants are allowed to fruit the first year, it weakens them for heavy fruiting the second year. For everbearing varieties, blossoms can be left after July 1 for fall crop.

Fig. 10.—These strawberries are in the second summer after planting. The clean wheat straw, which was applied the preceding November, conserves moisture, prevents heaving of the plants during winter, and keeps the berries clean. The canvas ooze hose attached to a garden hose provides irrigation.

COMMON PESTS AND DISEASES.—Strawberries are relatively free from insects and diseases and usually do not require spraying. If two plots of ground are rotated as shown in Figure 1, and each plot fruited only 1 year and then plowed or spaded, diseases and insects will be kept at a minimum. *Red stele* disease has been commonly reported in most areas in Ohio. The best method of control is by the use of resistant varieties and by replanting in new areas with plants purchased from nurseries that have been inspected at least twice a year for the presence of red stele disease and certified as clean. Such varieties as Sparkle, Temple, Pathfinder and Aberdeen have been found to be very resistant to this disease. *Black root rot* is common on poorly drained sites or in plantings that have been winter injured due to improper mulching or exposure to extremely low winter temperatures. *Leaf spot* is not likely to cause serious damage on the varieties recommended in this bulletin. Crown injury from *white grubs* (see Fig. 7) shortly after planting can be avoided by using ground that has been under cultivation for at least a year preceding the planting of strawberries.

For the prevention and control of the *strawberry leaf roller,* a leaf chewing worm, dust with 3% DDT dust, or spray with 6 tablespoons of the 50% DDT wettable powder in each 5 gallons of water. Make the first application in August when the tiny larvae first appear and repeat in 15 days.

If an application is needed in the spring when the berries are more than one-half grown, or when fruits are ripening, use a summer oil at the strength of 1¾ cup with Blackleaf 40 at the rate of 2 tablespoons in each 5 gallons of water; or use powdered derris root at the manufacturer's recommended strength. DDT spray or dust should be applied if the second brood of larvae appears in August.

HARVESTING.—Avoid mashing berries while picking; pinch off the stems with the berries. Pick when foliage and berries are dry. The fruit should be kept out of the sun or placed in the icebox immediately to prevent deterioration. Pick a given row about every other day.

RENEWING THE PLANTING.—Strawberries may be fruited more than one year provided weeds, insects and diseases have not been a problem. It is true, however, that yields and size of berries become progressively less the second and third year. It is unwise to fruit the planting more than three succeeding years. To renew the planting, plow or spade the middle and one side of the matted rows shortly after picking season. Leave a row of young parent plants 6 inches wide.

Fertilize, cultivate, irrigate and mulch the plants as described for newly set plants. For good yields of large berries, however, it is recommended that the planting be turned under shortly after fruiting and set to new plants the following spring. Such ground could be used for late vegetables. If the same variety is to be replanted reserve a small section of the old planting as a source of plants for the new bed next spring.

Brambles

(Raspberries, Blackberries, Dewberries, and Boysenberries)

Planting.—Plant in late March or early April, slightly deeper than the plants grew in the nursery. Gently firm the soil around the roots with the foot.

Soil Management.—The brambles should be cultivated and hand hoed the first and second seasons. For red raspberries and blackberries, allow the plants to fill in a hedge row about 1 to 1½ feet wide at the base. Remove plants which arise between the rows. Row mulch with cultivation between the rows is a good practice to keep down weeds and conserve moisture. A bramble planting will last about 8 to 12 years, when it should be removed and renewed, preferably on another plot of ground. In early November, the Boysenberry, Youngberry and Dewberry canes should be laid horizontal and covered with 2 inches of soil to prevent winter injury. Uncover and prune them in March.

Fig. 11.—Newly set raspberry plants should be circled with about a handful of nitrogen fertilizer a month after planting.

Fertilization.—A month after planting, each plant should receive about a handful of nitrogen fertilizer such as ammonium sulphate or a complete fertilizer used to supply about the same amount of nitrogen, as shown in Fig. 11. In later years, the fertilizer may be distributed in early spring along the sides of the rows at the rate of 2 to 3 ounces of ammonium sulphate per plant used on the soil surface. Double or triple this amount of nitrogen may be needed if row mulch is used.

Pruning.—The fruit of brambles is borne on canes which arise from the roots one year, fruit the next, and die shortly after. Red raspberries are pruned differently from black and purple raspberries and blackberries.

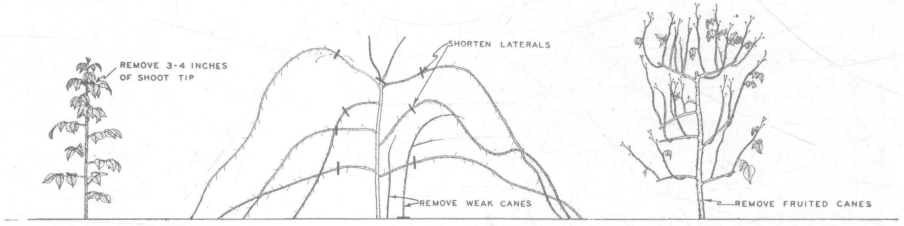

Fig. 12.—Shoots of the black and purple raspberry arise from the roots early in the growing season. When they attain proper height summer pinching induces vigorous laterals which are shortened the following March. Bearing canes are removed immediately after harvest.

Tips of long laterals have taken root. New plants can be obtained by this means. Tips of laterals are covered in August with 2 inches of soil, to induce rooting. Remove them from the mother plant the next spring, leaving about 6 inches of the mother cane for convenience in transplanting.

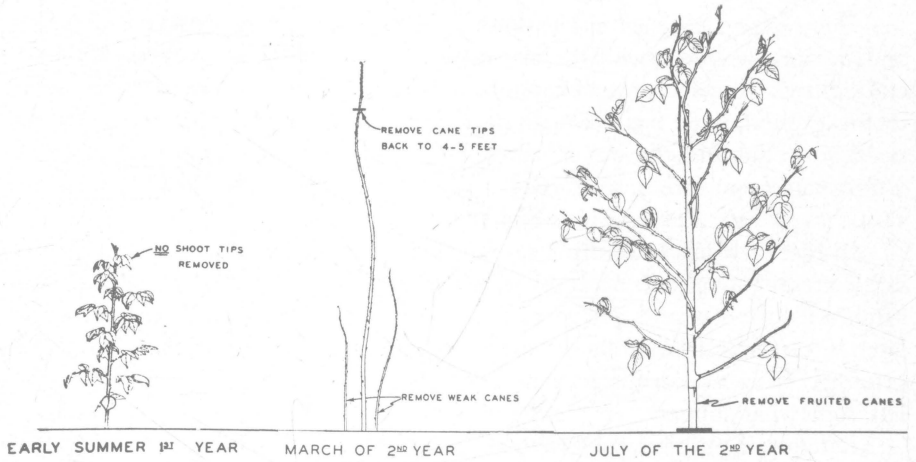

Fig. 13.—*Red raspberry* shoots from the roots require no summer pinching. Few, if any, laterals are formed. In March of the following year, the weak canes are removed, and the tips of the remaining canes cut back. Immediately after harvest, the fruiting canes are removed and burned.

Black and purple raspberries require *summer pinching* of the new shoots, (see Fig. 12). Remove the top 3 or 4 inches of the new shoots with gloved fingers or shears when they have attained a height of 18 to 24 inches for black raspberries, and 18 to 30 inches for purple raspberries. This induces laterals and results in a low, stocky plant. The tips of new shoots should be removed at weekly intervals as they appear before and during harvest. Summer pinching of the ends of blackberry shoots of upright growing varieties as Eldorado is ordinarily done when the plants are about 30 inches high.

Red raspberries are not summer pruned (see Fig. 13). Soon after the old canes of brambles have fruited, they should be removed close to the ground and burned.

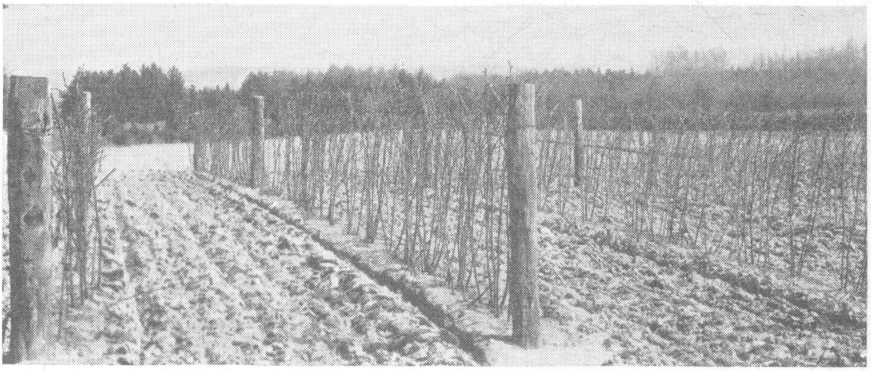

Fig. 14.—Red raspberries respond well to cultivation. Note the size and distribution of the vigorous canes. Tops of canes are included between two No. 11 horizontal galvanized wires between the posts. This facilitates picking, spraying, and general management.

Dormant pruning should be done in March after danger of winter freezing and before the buds swell in the spring. Red raspberries require only light cutting back of tips to prevent canes from later becoming top heavy and bending to the ground with fruit. Small spindly canes should be removed from the hedge row, leaving the larger canes which are ½ inch or more in diameter and from 6 to 10 inches apart. Canes should be confined to a hedge row about 12 inches wide at the base (see Fig. 14).

In case of black and purple raspberries, which have been summer pinched, it is necessary to prune back the laterals rather severely in March. For black raspberries, the size and quality of the fruit is improved by leaving the stronger laterals carrying from 8 to 12 buds on branches about 8 inches long after pruning. Weaker laterals may be cut shorter; very vigorous laterals may be left somewhat longer.

Laterals of purple raspberries are pruned back to 10 to 14 inches depending upon their vigor. Small spindly laterals should be removed entirely. Yield may be reduced if fewer than five laterals are left per cane. Do not remove canes over ½ inch in diameter at the ground level, as thick canes are most productive. However, it is advisable to remove any surplus raspberry canes smaller than ½ inch in diameter.

Laterals of blackberries which have been summer pinched should be left about 18 inches long. With blackberries, it is sometimes best to wait until the blossoms appear before the laterals are cut back. Some varieties tend to bear fruit far out on the laterals, and such a practice prevents cutting away too much of the crop. This is particularly true of Eldorado variety, which is recommended in this bulletin.

The dewberry, Lucretia variety, is a prostrate growing bramble. It usually is planted in hills and trained to 7½-foot stakes, which are sunk in the ground about 2 feet. After the crop is harvested, old canes are removed and the patch is cultivated in one direction until the new canes seriously interfere. Cultivation is then discontinued and the canes allowed to grow at random over the ground The following March, seven or eight of the strongest canes in a hill are tied to the stake and cut to a height of about 5 feet.

The Youngberry and Boysenberry are vigorous trailing brambles and are usually trained to a two- or three-wire vertical trellis as shown in Figure 15. During March pruning, the canes are left about 5 or 6 feet long, or longer if very vigorous, and tied to the wires. New canes which arise at the ground surface in the spring are allowed to trail along the ground in the direction of the row. As soon as the canes have fruited in summer, they are removed close to the ground and burned. Since these brambles are very thorny, it is wise to wear high boots, heavy trousers and a coat such as a hunting outfit, and leather gloves during the pruning operation. The new "thornless" varieties are worth testing. The brambles should be renewed every 10 to 12 years by plowing up the roots and setting new plants. It is preferable to plant on a new location.

Common Insects—Insects attacking the brambles are usually of minor importance. *Red spider* injury results in a gravish lusterless cast of the leaves. The spiders are tiny, more greenish than red, and move slowly over the leaf surface. In case of severe injury, the leaves may become brown and die. Hot dry weather favors the pest. A spray containing 1 pint of white or summer spray oil in 12 gallons of water and applied with high pressure as soon as mites are seen is often helpful. More than one application may be necessary.

Occasionally the shoot tips will die or wilt, or there will be bulges in the cane due to *borers* working in the pith. Such canes should be removed and burned as soon as noticed.

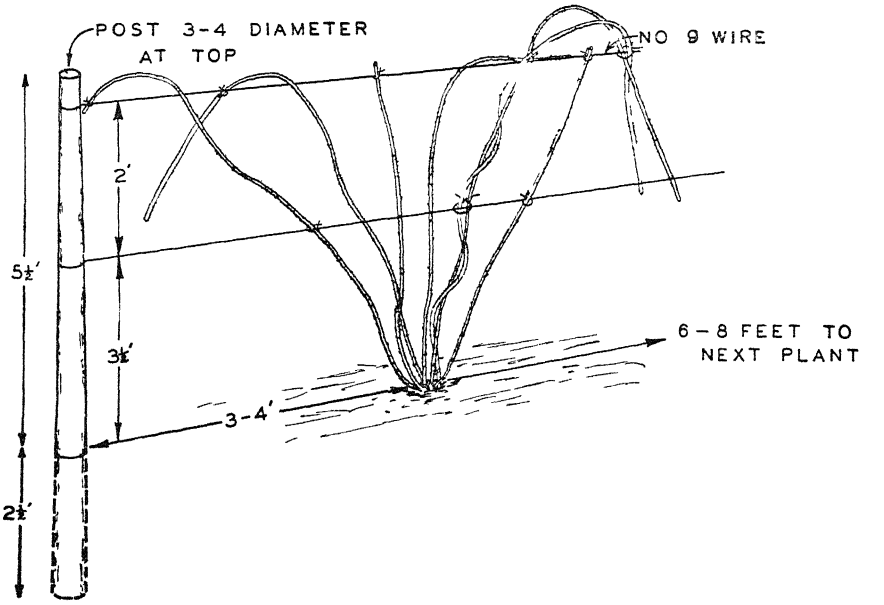

Fig 15—A two-wire trellis is useful for training the dewberry, the trailing type blackberries, the Boysenberry, and Youngberry The trellis should be established before the beginning of the second year Numbers 11 or 12 wire handle easier than number 9 and are satisfactory for most berry trellises

Common Diseases.—Raspberries are subject to many diseases, most serious of which are the *Viruses* such as leaf curl (deep green leaves curl downward and inward), *mosaic* (leaves green and yellowish-green mottled), and *streak* (reddish or purple stripes on canes in mid-summer, in addition to leaf mottling and curling).

The raspberry virus disease can be controlled by the use of healthy planting stock and systematic elimination of diseased plants whenever they appear.

The black and purple raspberries are more likely to succumb to virus diseases. Red raspberries may be damaged only slightly, but it is possible for the virus to be spread from red raspberry plants to purple or black raspberries by

plant lice. Another disease, *anthracnose,* is likely to be serious on purple and black varieties, but is usually not damaging on red varieties. Anthracnose is characterized by oval spots on the canes with a purple edge and a sunken center, light gray in color (see Fig. 16). *Crown gall,* a difficult disease to control, appears as "cauliflower" swellings on the roots, crown, or lower part of the cane.

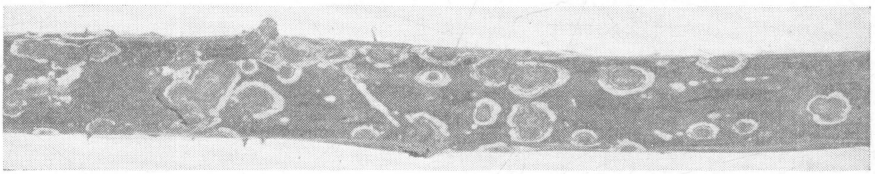

Fig. 16.—Anthracnose is a common disease affecting the canes of brambles, especially black raspberries. The disease may markedly reduce yield or kill the canes. It is controlled by a delayed dormant lime-sulfur spray.

Best control of raspberry diseases is obtained by observing the following precautions:

1. Plant the most disease-free plants obtainable. (Seek State inspected plants)
2. Keep plants growing vigorously by good cultural practices.
3. Remove and burn "handles" or portions of the old cane on black and purple raspberry-tip plants immediately after planting.
4. Remove old diseased raspberry plantings to prevent spread of disease to new plantings.
5. Dig and burn all plants found to be affected with such diseases as curl, mosaic, streak, and rust.
6. Remove and burn old fruiting canes immediately after harvest.
7. Remove and burn all dead canes when pruning in spring.
8. Spray every spring when buds show ½ inch of green with dry lime-sulfur, 1 pound in 4 gallons of water or 1 gallon liquid lime-sulfur per 11 gallons of water for anthracnose control.

Irrigation.—The brambles respond well to irrigation. The same procedure as outlined for strawberries may be followed. Watering during dry periods often makes the difference between a fine crop of large berries or a mediocre crop of small seedy berries.

Harvesting.—Picking season for the brambles may last for a period of 2 to 6 weeks, depending upon the variety. Pick every 2 days, preferably when it is cool and the berries are dry. Place immediately in refrigerator or cool cellar.

PLANTING.—Prune the roots and tops of nursery plants as shown in Figure 17. Set them in March or April slightly deeper than they grew in the nursery.

SOIL MANAGEMENT.—For best response in growth and fruiting, grapes should be cultivated during the growing season. In addition to other advantages, this tends to reduce trouble from insects and diseases which harbor in grassy areas. If the grapes are located in a sodded area along the fence row or in the yard, the area should be spaded 3 to 4 inches deep to a distance of about 2 feet from the trunk of each vine.

FERTILIZATION.—Experiments have shown that a moderate amount of manure (three or four shovels per vine per year) worked into the soil over the roots is the best fertilizer for grapes. Manure may be applied in the fruiting vineyard either in fall or early spring, preferably in the fall, so that it will partially rot during winter months. However, if manure is not available, apply ammonium sulphate, or similar nitrogen carrying fertilizers, spread in a ring about a foot from the trunk on the surface of the ground. About ½ pound is adequate for each bearing vine and about half this amount for young vines. Commercial fertilizer should be applied about two weeks before the buds swell in spring. If the grapes are growing under sod or semi-sod conditions, it would be well to double or triple the fertilizer application per vine to allow for that used by the grass roots. Avoid over-fertilization. It causes too rapid growth in spring and results in a poor set of berries.

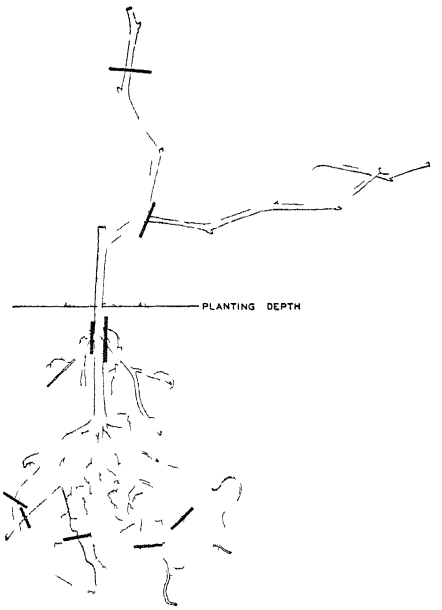

Fig. 17.—Before planting, the tops and roots of a grape plant are pruned as indicated by the black marks. The planting depth is shown

IRRIGATION.—Furrow irrigation, wetting the soil to a depth of 8 to 10 inches during dry summer periods, will result in better flavored and larger grapes.

PRUNING.—Grape bunches are borne on shoots which arise from buds on the 1-year wood known as canes. Prune the grapes annually to train the trunk and arms so that the minimum amount of old wood supports the desirable type and distribution of fruiting canes. Figure 19 shows the Concord grape which has been trained to the four-cane-single-trunk Kniffin system. After

pruning, a vine with the approximate vigor of Concord should carry about four or five canes which contain a total of about 40 buds. You will note in Figure 19 that there is a renewal spur at the base of each cane. This is a cane which has been cut back to one or two buds. From these buds will arise shoots which will develop into canes to be used the following year for fruiting wood. After the old canes have fruited, they are wholly or partially removed the following March.

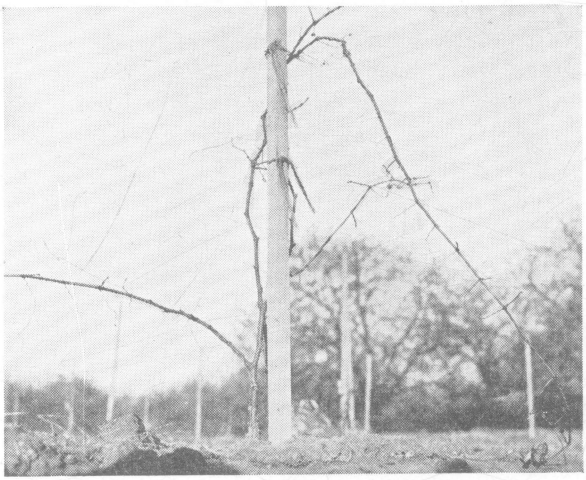

Fig. 18.—Grape plants should be staked shortly after planting to aid in developing a straight trunk. Stakes are removed when the trellis is erected the beginning of the second or third year.

First Year. — After planting, prune off all but the strongest cane which is cut back to two buds (see Fig. 17).

Second Year.—Remove all but the best cane; tie this cane to a 4 to 5 foot 2- by 2-inch stake, or similar anchor (see Fig. 18). The two trellis wires, No. 9 or 11 gauge galvanized, should be erected the second year. The lower wire is usually 30 to 36 inches above the ground and the upper wire about 2 feet above the lower wire. Desirable wood posts are locust, white oak, osage orange, or similar sturdy slow rotting wood, 7½ to 8 feet long and 3 to 4 inches in diameter at the top. They are sunk in the ground about 2½ feet at intervals of about 24 feet.

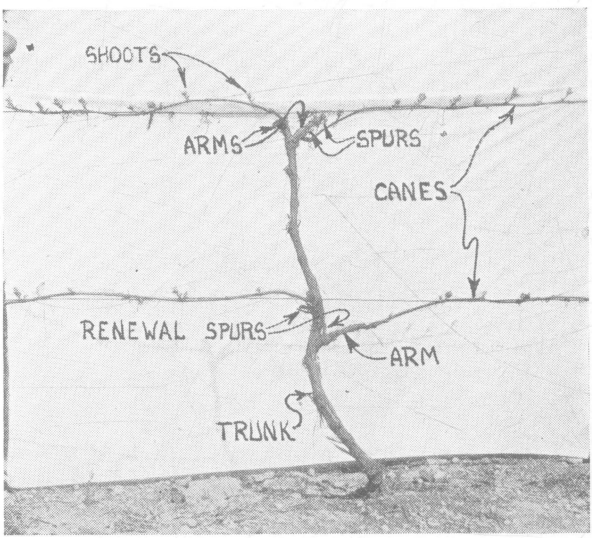

Fig. 19.—This grapevine is trained on a two-wire trellis to the single trunk four-cane Kniffin system. The four fruiting canes carry eight to ten buds each. A renewal spur at the base of each cane will provide a fruiting cane for the next year, when the present canes will be removed.

This allows three vines between two posts. There is a growing preference for steel posts. These are quite durable and drive into the ground easily when the trellis is set up and are easily driven down to place each spring as necessary.

Third Year.—This year the vine, if vigorous, can carry about 25 buds after pruning. For the Kniffin system, 4 shorter canes can be used, two at each wire level extending horizontally left to right from the trunk. These short canes become the arms from which fruiting canes are selected for each wire level in later years.

In pruning mature vines, select medium-sized canes which are carrying healthy, plump buds (see Fig. 20). With the Concord or varieties of similar vigor, canes which measure about ¼ inch in diameter between the fifth and sixth buds have been most productive. Leave about 8 to 10 buds per cane after

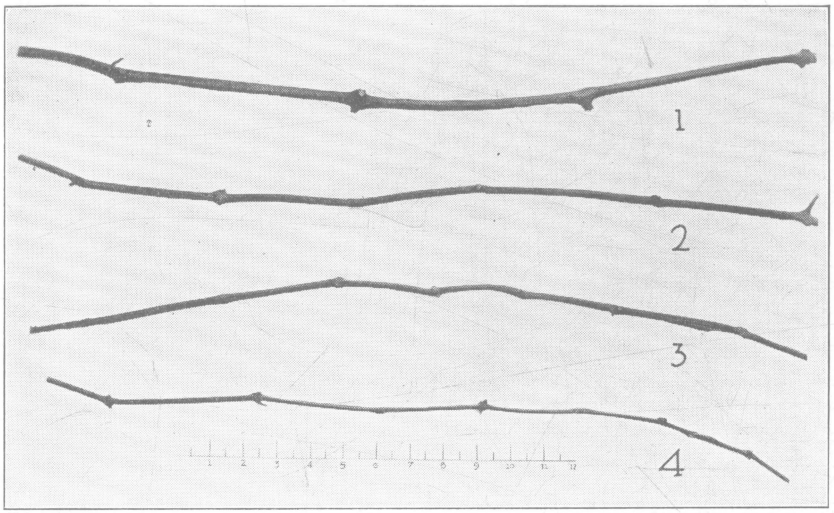

Fig. 20.—Fruiting canes vary in growth and ability to produce fruit clusters. Cane No. 1 is too large, buds are far apart and are small; Nos. 2 and 3 are good. No. 3 is particularly good. Buds are plump and are close together. No. 4 is too small.

pruning. On arbors, where shade is important, more old wood must be left to distribute the canes over the arbor. More fruiting canes with fewer buds to the cane are left in order to properly distribute the fruiting capacity of the vine (see Fig. 21).

Figure 22 shows a system of trellising and training grapes which is well suited to home gardens. The type and amount of fruiting wood left after pruning is essentially the same as for the Kniffin system, except the wood is placed differently.

Pruning Neglected Vines.—Where the mature vines have been neglected for a year or more, they become very rangy with too much old wood. The best fruiting wood is usually found a long distance from the trunk or base of the vine. Cut back the trunk and arms as far as possible to a point just ahead of four or five reasonably desirable canes for fruiting (see Fig. 20). Leave about eight to ten buds per cane and four renewal spurs.

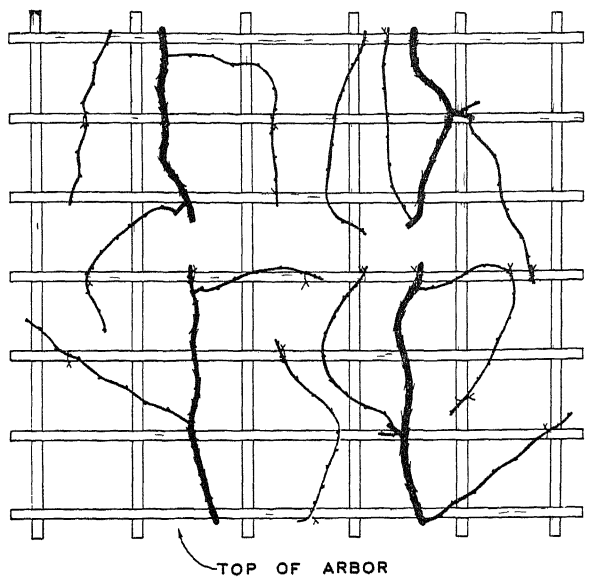

Fig. 21.—More fruiting canes are left in arbor-pruning than for trellis-pruning, because shade is a factor here. A modification of the single-trunk Kniffin plan of training can be used. Sketch shows vines after pruning.

After two or three years of renewal pruning, the neglected vines can be brought back within reasonable bounds to a fairly manageable pattern. If neglected vines are dehorned (cut back to large stubs with little or no fruiting wood), there are no canes left for fruiting, and it will take a year or two before such vines produce again.

It will take a few years to train the neglected vine to a definite pattern as shown in Figure 19, and therefore, it is important that the pruner bear in mind where the best fruiting wood is located and use his judgment in leaving fruiting wood with the proper number of buds.

COMMON INSECTS AND DISEASES.—*Black rot* is a common disease in wet seasons. In mid- or late-season, the berries turn from green or red to brownish-black, shrivel, and some drop to the ground. Dark brown lesions appear on the leaves and petioles. *Mildew* appears as yellowish-green, somewhat translucent splotches on the upper surface of the leaves, while the under surface shows a downy growth. The berries, if infected, turn brown, shrivel and drop. *Worms* of the grape berry-moth first cause a red spot to develop on the green berry followed by shriveling and dropping of the berries. These are now controlled by applying DDT sprays. *Leafhoppers* (about ⅛ inch long, winged and fly out in swarms like gnats), suck sap from the leaves, causing them to appear

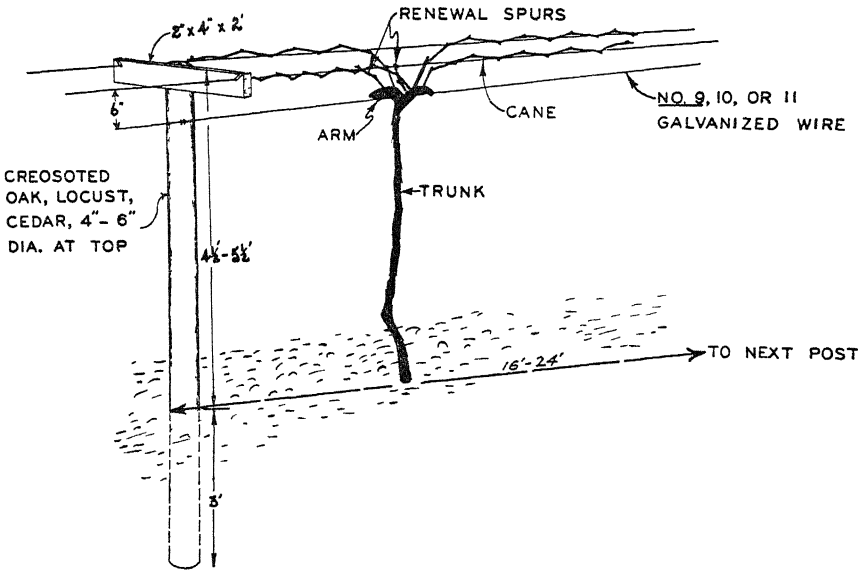

Fig. 22.—The system shown above is convenient for training grapes in the home planting. It is easy to pass under the wires from row to row to cultivate, spray and harvest. Canes can be tied to lower wire, allowing fruiting shoots to grow up and over upper wires.

whitish and later turn brown and die. The quality and size of the berries are affected. Leafhoppers cause more foliage damage than any other grape pest, and unless controlled with DDT spray reduce both yield and quality. (See page 79 for control measures for these insects and diseases.)

HARVESTING.—In case of blue and red varieties, wait until all berries of a bunch have attained full color and flavor. If necessary, grapes may be left on the vine for a week or two after they have attained maximum sugar and flavor. When left too long, however, they assume a somewhat bitter taste and become mushy. Store the grapes immediately after picking in a cool cellar or cold storage. Small quantities can be kept in the refrigerator.

Blueberries

With the rapid improvement in cultivated varieties of the high bush blueberry there is growing interest in trying to raise blueberries in the home garden. They thrive best in full sun and on locations free from competition of roots from nearby trees.

Soil Requirements.—The blueberry plant requires an acid soil (*p*H 4.0 to 5.0), which is relatively high in organic matter. It does best on a site relatively free from late spring frosts. For home plantings where soils are not sufficiently acid, several materials may be used to increase soil acidity, including sulphur, sulphate of aluminum, crude tannic acid, and acid peat moss. The use of sulphate of ammonia as a nitrogen fertilizer will increase soil acidity. If you live west or north of a line drawn from Cleveland to Columbus to Cincinnati, the probabilities are that your soil will need to be treated to acidify it sufficiently. East of this line there is less need for acidification except on soils that have been limed. Color, smell, or presence of moss are not definite indications of an acid soil. It is best to have a sample of the soil tested for its reaction through your County Agricultural Agent.

For soils testing above pH 5.0 it is recommended that 1 pound of sulphate of aluminum, or alum, and ½ pound of finely powdered sulphur be mixed with each square yard of soil surface. In following springs scatter ½ pound of sulphur over each square yard and scratch it in. City water or hard well water for irrigation purposes usually adds too much lime and it is not recommended where it is a problem to maintain an acid soil.

Blueberry plants succeed best where the water table can be maintained at from 14 to 22 inches below the surface, and at least during the spring months it is desirable to have the water level in the soil about a foot from the surface. Soil drainage down to the water table should be good. Soils and sites providing the best requirements are very limited in Ohio, but reasonably good growth can be secured on many garden soils where at planting time the top soil is mixed half and half with peat moss, and this soil-peat mixture used in the hole to a depth of 12 inches and firmed around the roots while planting.

Planting.—Set plants at least 4 feet apart for hand cultivation. The plants should be set no deeper than they grew in the nursery as the blueberry is a shallow-rooted plant. After planting, prune off all fruit buds (large plump buds) and remove any dead, broken or very weak branches.

Soil Management.—Blueberry plants are shallow-rooted and cultivation, therefore, should be shallow, only deep enough to control weeds. Start cultivation in early spring and continue as needed until after berries are picked. For home plantings, heavy mulching is satisfactory and can be substituted for cultivation.

Mulching.—A good surface mulch can be maintained around the plants by using peat moss, sawdust, leaves, lawn clippings, straw or other convenient

materials. Mulch should be deep enough to smother weeds and extend a foot or more beyond the branch spread of the bush. It is often desirable in home plantings to mulch the entire area. Freshly cut oak sawdust is a satisfactory mulch if sufficient nitrogen fertilizer is supplied to assist in its decomposition.

FERTILIZATION.—Beginning the spring of the second year, sulphate of ammonia can be used as a top dressing around the plants at the rate of 1 ounce per bush, increasing the application at the rate of 1 ounce per plant per year until about 5 ounces are used on mature plants. Where surface mulch is used this rate of applying nitrogen fertilizer can be doubled or more to secure satisfactory growth and foliage development. A complete fertilizer, such as 10-6-4, can also be used at double the rate recommended above.

PRUNING.—No pruning is usually needed until plants are 3 years old. Only light pruning is recommended in March or April. Dead or broken branches can be removed; also branches that are growing too close to the ground which might produce soiled berries. The thin bushy wood on old bushes can be removed or cut back to a vigorous lateral. On light soils deficient in organic matter, pruning can be somewhat heavier, but for the most part should be light, merely removing weak, shaded growths that would otherwise be inclined to produce fruit of inferior size and quality. Varieties which have a spreading growth habit such as Cabot and Pioneer require more pruning on the outside of the bush to remove low-hanging branches. Upright growing varieties such as Concord and Rubel need to be thinned at the center. From three to six buds per shoot are left on the 2- and 3-year branches.

PEST CONTROL.—The worst pest of the blueberry in the home garden is birds, principally, robins. As the berries approach ripening, the bushes can be covered with cheesecloth or similar netting.

GOOSEBERRIES AND CURRANTS

PLANTING.—Plant in the fall or early spring so that the lower branch of each plant is just below the surface of the ground.

SOIL MANAGEMENT.—These fruits respond best to cultivation, but in a home garden it is often convenient to mulch with 3 to 6 inches of straw, peat moss, strawy manure, or coal ashes. If field mice are a problem, poison the mice with zinc phosphide as recommended on page 38, or pull the straw away from the plants about 18 inches to help keep the mice away from the tender bark.

FERTILIZATION.—Gooseberries and currants will respond best to 2 or 3 inches of strawy manure applied preferably in November as a mulch about the plant. If manure is not available, nitrogen in the form of sulphate of ammonia or a similar carrier may be used at the rate of about ¼ pound per plant applied in late fall or early spring. If the plants are set near or under trees in the backyard, the competition for water and nutrients is great. Therefore, one should take special pains to see that the plants receive adequate amounts. Growing conditions may be considered satisfactory if the growth is vigorous (new

crown shoots from 15 to 20 inches long), the plants productive, and the foliage is a dark healthy green.

Pruning.—The plants are bushlike, varying in height from 3 to 5 feet. They bear some fruit near the base of 1-year wood and produce the most and best fruit on spurs of 2- and 3-year canes. Older wood produces inferior fruit. Prune in March or early April before the buds begin to swell. The object of pruning is to remove canes over 3 years old and, by thinning, select the proper kind and number of younger canes to maintain a productive bush. Judge age of canes by counting back annual growth rings (note change in color and character of bark for each year) starting from the tip. After pruning, the well

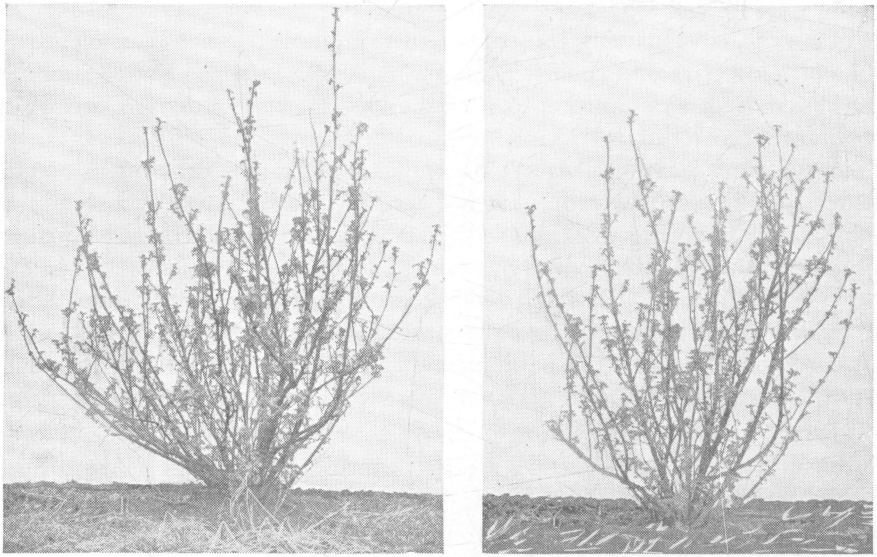

Fig. 23.—On the left is a Red Lake currant, before pruning; on the right, after prunnig. Tall growth has been cut back, and low horizontal branches and wood older than 3 years has been eliminated. The 1-year shoots in the middle of the bush have been thinned to three or four vigorous shoots.

pruned dormant bush will have about three shoots each of 3-, 2- and 1-year wood. With old bushes a few more canes of each age are left after pruning. Thin out surplus, slender, weak, and low growing canes. Wood growing horizontal and close to the ground should be removed to avoid dirty fruit.

Control of Insects and Diseases.—The *Imported Currant Worm* is the chief pest of currants and gooseberries. Defoliation can be prevented by spraying with rotenone extract, or dusting with either 0.5 or 0.75 per cent rotenone dust as soon as the worms are observed. The same dust or spray as recommended in the petal-fall application on apple is also good insurance against injury. Do *not* apply arsenical sprays when fruits are approaching maturity. *Aphids*—These small, soft-bodied green or black insects suck sap from the

underside of the leaves, causing them to curl and wrinkle until they are distorted. The rotenone dust described above is effective against aphis provided it hits the insects. *Leaf spot*—Appearance of this disease is similar to *anthracnose*. Symptoms are many small brownish spots on the leaves, which cause them to turn yellow and drop. Ready-mix Bordeaux at manufacturer's recommendations should be applied when first symptoms appear. Two or three sprays including an after harvest spray are sometimes necessary to keep the disease in check when the weather is particularly wet.

HARVESTING.—Currants for jelly should be picked before fully ripe, or while an occasional green berry is showing. The clusters should be removed carefully to avoid mashing. Because of thorns, it is suggested that leather gloves be worn for picking gooseberries. For pies, jellies and jams, gooseberries should be picked at their fullest size, but before they turn reddish-brown and become dead ripe. Fruits of the Poorman gooseberry are of excellent dessert quality when eaten out of hand at the reddish-brown ripe stage.

Cultural Management of Tree Fruits

APPLES

PLANTING.—Apple trees can be planted in the late fall or early spring. Fall planted trees may need trunk protection against rabbit or mouse injury, but usually start into growth earlier and better than spring planted trees. Dig the hole large enough to accommodate the root system without crowding. Set the tree at the same depth that it grew in the nursery. Lay the top soil in one pile and the subsoil in another. Place the tree with the lowest branch and preferably the heaviest branches toward the southwest, or the direction from which prevailing summer winds blow, and lean the tree slightly in this direction.

To encourage rapid rooting and good leaf growth, it is desirable to mix a 3-gallon bucket of wet peat moss with the top soil and use this peat-top soil mixture to thoroughly cover the roots, shaking the tree up and down while filling around the roots to avoid air pockets (see Fig. 24). As soon as the roots are covered, tramp the soil compactly in the hole with the feet. Finish filling the hole with subsoil. A slight "dish" in the ground surface around the tree will act as a reservoir for rain water or summer irrigation. If drouth periods occur in late spring or early summer, wet the soil around the roots to a depth of a foot at 2-week intervals or as needed. Level or slightly mound the soil around the trunk in the fall to prevent water or ice pockets around the tree during the winter.

Do not use fresh manure or nitrogen fertilizer in the hole at planting time. If manure is available, a surface mulch around the tree can be made after planting. On soils low in fertility, ¼ pound of a nitrogen fertilizer can be placed in a ring about 6 inches from the trunk a month after planting.

Soil Management.—Apple trees grow best the first few years where they can be cultivated from early spring until midsummer, and then the area sown to an over-wintering cover crop, such as rye or ryegrass. The cover crop is plowed or disced down early the following spring and the program repeated. But for most home plantings the cultivation program is impractical. The most satisfactory all-around program is the system of sod culture between the trees with additional mulch circles under the branches, where mulch material is available (see Fig. 25). If mulch cannot be provided, a circle under the branches of the trees can be hoed or spaded. It is recommended that the cultivated circle or mulched area be about 8 feet in diameter when trees are planted and extended each year to slightly beyond the spread of branches.

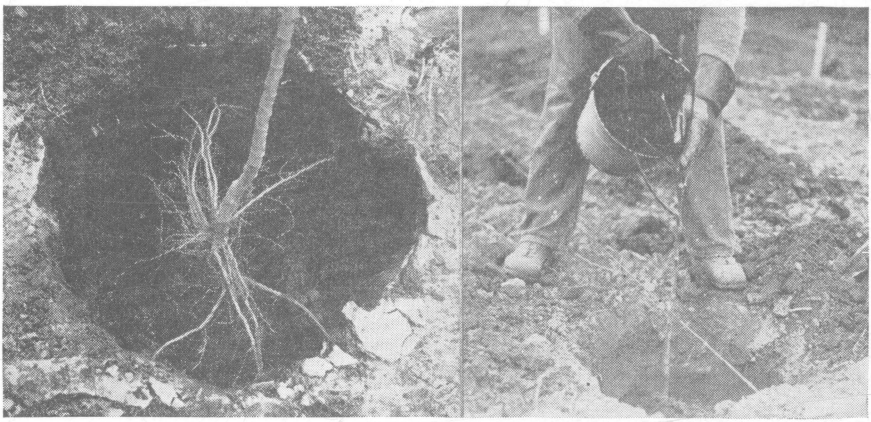

Fig. 24.—The hole should be dug large enough to accommodate the root system. Cut back broken and long roots. Set the tree as deep as it grew in the nursery. Better tree growth is obtained if a 3-gallon pail of wet peat moss is mixed with the soil as it is sifted about the roots. Lift and lower the tree slightly while filling the hole, and tamp the soil thoroughly as roots are covered.

To start a mulch program for mature standard size apple trees, it requires about 100 pounds of dry straw (about 1 bale) per tree or its equivalent in other mulching material, such as lawn clippings, leaves, shredded corn fodder or sawdust.

The mulch should begin about 18 inches from the trunk and should be maintained deep enough to prevent growth of grass and weeds through it, and extend slightly beyond the branch spread. As the mulch continually decays it is necessary to add additional mulch from year to year. It usually requires about a bale of straw per year, or its equivalent in other mulching material, to maintain a satisfactory mulch below the branches of large trees. Mulch conserves moisture, maintains rather uniform and desirable soil temperature, provides many essential mineral nutrients as it decays, improves aeration and tilth of soil, supplies needed organic matter in adequate quantities and dropped fruit can be picked up from the mulch with least damage and soiling. Mulch

may harbor mice which, however, can be controlled with a consistently practiced poisoning program.* A good mulch has provided the most satisfactory soil conditions for growth and fruiting of trees when adequate nitrogen fertilizers have been used over the mulch.

The grass between the trees should be mowed three times a year or more often if possible. It is desirable to rake the clippings while fresh cut and use them for circle mulch beneath the branches of the trees. The more frequently the grass area is mowed the less trouble there will be with trash insects, such as curculio and buffalo tree hopper. The latter insect is particularly troublesome on young trees, splitting the bark in small sections where the eggs are laid.

Fig. 25.—Fertilizer is spread over the mulch, beginning near trunk and extending as far out as branches spread. Note ¼-inch-mesh galvanized cloth around the tree base for rabbit and mouse protection.

Rodent Control.—To minimize mouse damage, a circle about 3 feet in diameter around the trunk can be covered with leached cinders or other gritty material that will not support vegetation. From 1 peck to ½ bushel of cinders per tree will act as a satisfactory barrier over this area.

To prevent gnawing of bark on trunks by rabbits and mice a good protector is made by preparing a cylinder of 12 by 18 inches of ¼-inch mesh galvanized hardware cloth, which can be anchored in the cinders (see Fig. 25). Such a protector will last for many years until risk from rabbit gnawing on the lower trunk is past. Temporary guards can be made by wrapping heavy paper around the trunks each fall and removing the guard in the spring. A satisfactory rabbit repelling paint for the trunks and lower branches can be prepared from powdered resin and ethyl alcohol. Denatured methyl alcohols are not satisfactory as they do not dissolve resin. Melt 1 pound of powdered resin, heating only

* Spraying Program and Pest Control for Fruit Crops. Ohio State University Agricultural Extension Service Bul. 128 (1947).

enough to dissolve resin. Then, add 1 pint of ethyl alcohol, previously warmed by immersing the container in a vessel of hot water, and stir. Keep this mixture in a tightly stoppered bottle and apply in the fall or whenever needed with a brush when bark is dry.

Mouse damage is best prevented by placing poisoned baits in active runways and holes during dry periods in October or early November. Zinc phosphide apple baits are recommended. Your County Agricultural Agent can assist you in securing a supply of the zinc phosphide. Cut firm fresh apples into ½-inch cubes, sift 1 teaspoon of zinc phosphide over 1 quart of the cut baits in the bottom of an old bucket, tumble the baits in the bucket until uniformly covered. Use a short sharpened stick to pick up the baits and place while fresh one at a time in active runways and holes, carefully covering over the runways where baits are placed so that trash will not fill the runway. A half dozen pieces of bait are sufficient under a heavily infested large apple tree. Trees should be examined every fall for presence of mice, and systematic poisoning done wherever they are found.

Fertilizers.—An annual application of a nitrogen fertilizer such as sulphate of ammonia, nitrate of soda, cyanamid or ammonium nitrate is recommended, at the rate of about ¼ pound for each year of age of the tree. If ammonium nitrate is used, 2½ ounces per year of age is sufficient. If a complete fertilizer such as 10-6-4 is used, which carries about half as much nitrogen per pound as sulphate of ammonia, use at the rate of ½ pound per tree per year of age. Apply nitrogen fertilizers in the fall from late September to December 1, or in late winter or very early spring. Where cyanamid is used, fall applications are definitely preferred. If cyanamid is used in the spring, apply early while buds are dormant. The other nitrogen fertilizers can be used as necessary during the growing season, but it is desirable in spring to apply the fertilizer a month ahead of expected bloom. Spread the nitrogen fertilizer over the area penetrated by most feeding roots which begins near the trunk and extends out somewhat beyond the branch spread (see Fig. 25).

To promote desirable growth of grass in the middles of the rows or between the trees, an application of superphosphate or 0-14-7 or 2-12-6 or similar analysis complete fertilizer is recommended at the rate of 1 pound per 100 square feet. This application can be made about every 3 years or oftener if needed to improve the grass.

Pollination.—Some apple varieties are self unfruitful when isolated from desirable cross-pollinating varieties. Stayman Winesap and Delicious are varieties mentioned in this bulletin which will not properly cross-pollinate themselves or each other. Where these two varieties are grown, a third variety nearby, such as Jonathan, should be planted to provide proper cross-pollination. Cross-pollination can be arranged in single trees by top-working one or more branches to a desirable variety.

RINGING.*—Where standard apple trees are growing very vigorously and have not blossomed when about 12 years of age, a special practice, known as ringing, can be used to induce flowering and fruiting. If desired this practice can be used on younger trees at about 8 years of age to induce early fruiting. Ringing is done about June 1. Two parallel cuts are made with a sharp knife, about 1/8 inch apart, completely around the base of a large scaffold limb. The bark is completely removed to the sapwood and the wound immediately sealed by covering with adhesive tape, electrician's splicing tape, or grafting wax. This prevents drying and encourages rapid healing of the wound. About half the branches distributed around the tree can be rung one year and the remainder the following year. Ringing the trunk will affect all branches on the tree and often is very successful with vigorous growing trees. Trees that are ringed should be expected to bloom and fruit the following year. It is seldom necessary to ring trees more than two consecutive years, because by this time the bearing habit usually is established.

THINNING.—It is the tendency of most fruit trees to set a heavy crop of fruit one year and a light crop the next. Yellow Transparent and Wealthy varieties are particularly inclined to do this. Heavy crops weaken the tree for production the next year. Hence, it is advisable to thin the fruits of early varieties as Transparent and Wealthy, as soon after fruits set as possible and thin late varieties in late June or early July so that they are spaced to average about 6 to 8 inches apart on the limb.

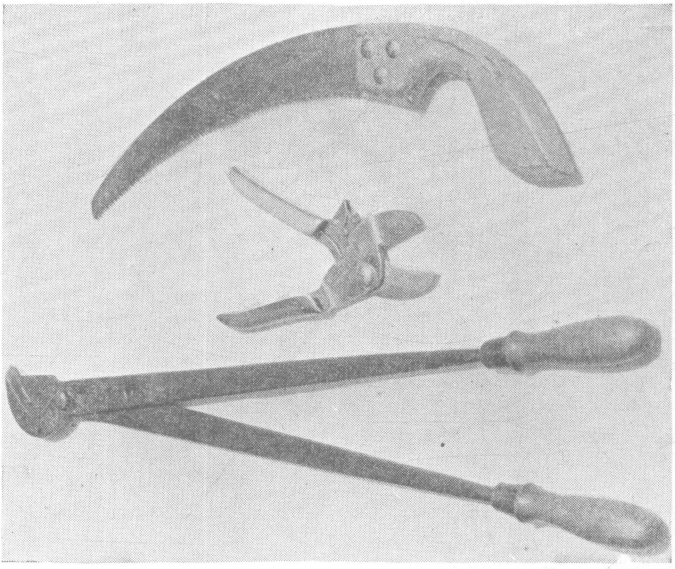

Fig. 26.—Essential pruning tools for the home fruit garden: (1) a half-moon saw which cuts on the draw; (2) hand shears; and (3) lopping shears with 2-foot iron handles.

Special attention should be given to reducing clusters of two, three, and four apples, leaving the best and largest single fruit in the cluster.

Remove first the insect and disease injured, small, damaged and deformed fruits, then any overload may be reduced by additional thinning.

* For further information send postcard to Ohio Agricultural Experiment Station, Wooster, requesting Bulletin 410 "Ringing Applied to the Commercial Orchard" by J. H. Gourley and F. S. Howlett. 1927.

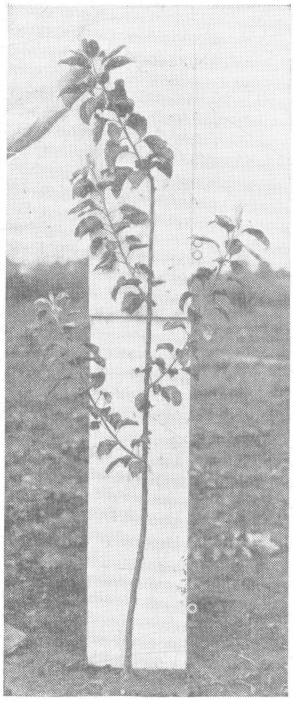

Fig. 27.—This tree has been trained by the deshooting system. The 5½-foot, 1-year Stayman Winesap tree was cut back to the strongest growing shoot near the top, about a month after growth started in spring. Shoots at this time were 6 to 8 inches long. Three additional shoots were selected below the top shoot. First shoot is about 20 inches from the ground and others are spaced 8 to 10 inches apart at about equal distances around the trunk. See Figure 31 for 12-year tree started by this system.

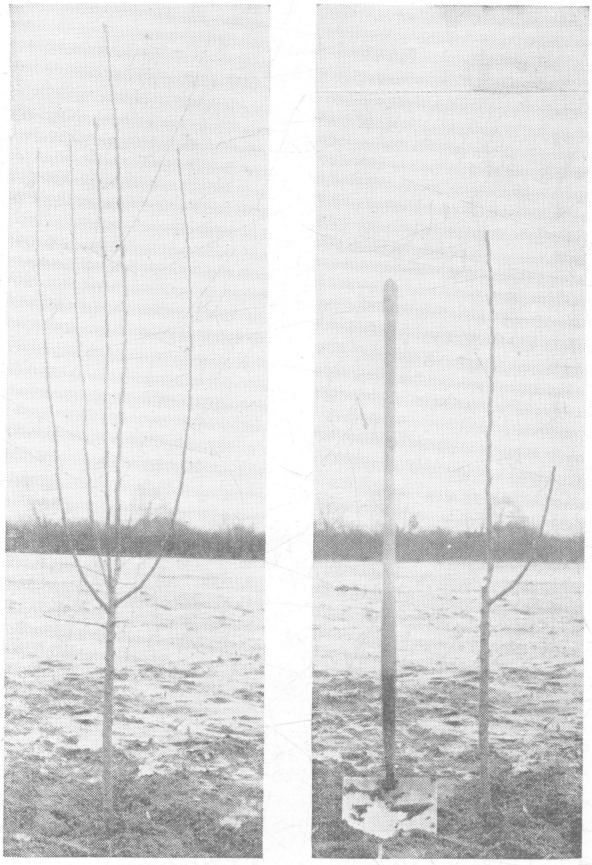

Fig. 28.—Two-year-old apple before and after pruning at planting time. Largest best central branch has been retained for the leader and cut back to about 50 inches. Tree was planted with best wide-angled lateral to the southwest, which was cut back two-thirds. All other laterals were removed because they arose too close together.

PRUNING.—The object of pruning is to develop a strong framework with young trees. As the trees get older and become dense it is important to remove underhanging, weak and dead wood and control the height and spread of the tree, at the same time keeping it sufficiently open to that spraying, thinning and harvesting can be arranged efficiently.

If vigorous 1-year trees are planted with a height of 5 to 7 feet, cut back to about 50 inches; and for smaller 1-year trees, cut back to about 30 inches in height. When the leafy side shoots are about 6 inches long in early summer,

select well spaced, wide angled shoots which will develop into a desirable scaffold system (see Fig. 27). If possible the lowest branch should be on the southwest side about 20 inches above ground. Where this is possible the second branch is preferred on the southeast side; the third on the northwest, and the fourth continuing the trunk into a northeast scaffold branch. This provides a main scaffold branch for each quarter of the tree. Branches which leave the trunk at a wide angle approaching 90 degrees make strong crotches. Those that leave the trunk at a narrow angle are weak and apt to split. These should be removed. It is desirable to have from 8 to 12 inches of vertical distance between the scaffold branches. It may take longer than one year to select the main limbs for a desirable scaffold system. The first need is to establish a single trunk and from it select and space desirable scaffold branches as they become available.

Where 2-year, branched trees are planted, prune to establish a single trunk around which scaffolds can be developed. Side branches on 2-year trees are usually too close together for permanent limbs, and all but one or two should be removed (see Fig. 28). Cut back the trunk or strongest upright branch about one-third and the side branches about one-half their length.

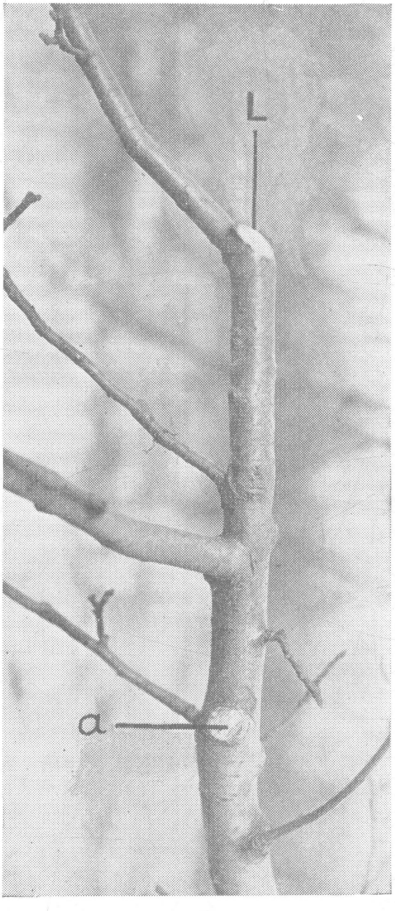

Fig. 29.—To shorten a limb, cut to a strong lateral as shown at L. The cut at *"a"* where a lateral was properly removed, is clean and flush.

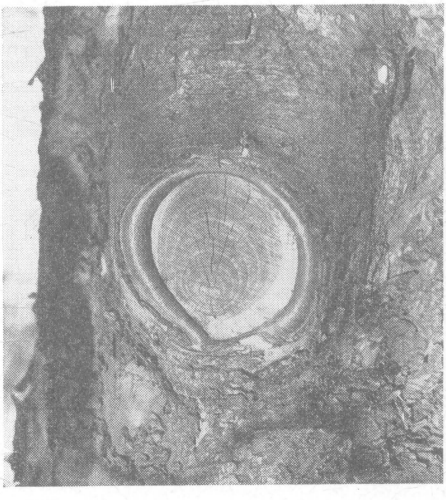

Fig. 30.—A properly made close pruning cut which is healing satisfactorily. Never leave stubs when removing branches.

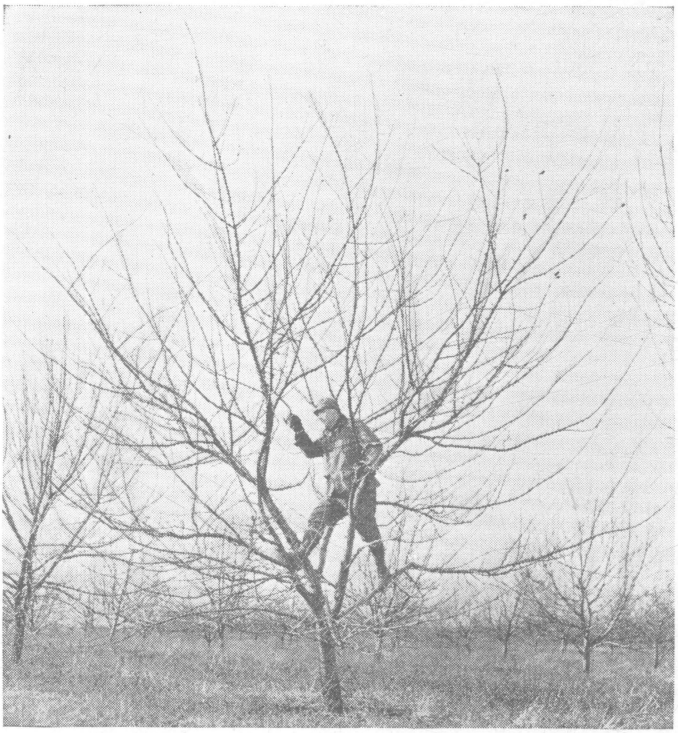

Fig. 31.—A 12-year, standard-size Stayman Winesap tree which shows strong framework development. The first main limb or scaffold branch, is about 20 inches from the ground. Other scaffolds are distributed around the trunk and 10 to 12 inches apart. This tree was trained at planting by the deshooting system on a 1-year, vigorous nursery tree (see Fig. 27).

PARTS OF TREE DEFINED

Trunk—The main central stem of the tree beginning at the ground level.

Central Leader—Trunk continuing as a single main branch from which framework branches arise.

Framework—Trunk with secondary large branches.

Scaffolds—Main branches arising from the trunk. Large branches arising from these are known as secondary scaffolds.

Lateral—A side branch.

Fruit Spur—Short growths, one or more years old, usually carrying both blossom and leaf buds and associated with fruit bearing wood.

Annual Ring—Circular bark line found at the base of each year's terminal growth. The age of younger branches can be traced back by counting annual rings.

Terminal—Length of branch growth from tip back to first annual ring.

Shoot—Succulent growing branch with attached leaves.

Water Sprout—Vigorously growing upright branch or shoot arising from an adventitious bud on trunk or large branch.

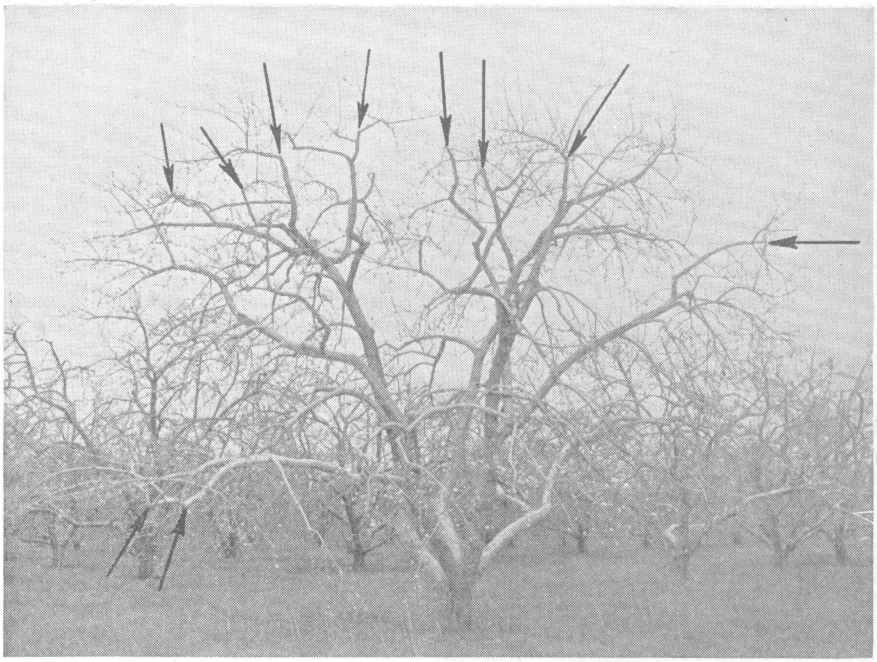

Fig. 32.—Large fruit trees are easier to manage if kept under 20 feet in height. Tree height and width are controlled by cutting branches back to strong-growing laterals as shown by arrows. Branches that droop to the ground with fruit should be removed to an upward growing lateral as lower arrows indicate.

In subsequent years continue light pruning to prevent development of narrow crotches and remove unnecessary water sprouts.*

The following pruning pointers may be helpful:

1. All pruning is a dwarfing process to the tree. Prune as little as possible to attain the desired training. Heavy pruning has a *definitely* dwarfing effect on trees and delays bearing.
2. Best months for pruning in the home garden are March and April. Pruning can be done as late as blossoming, but this should be performed only as an emergency.
3. A certain amount of training can be done on young trees in summer by removing shoots which are obviously growing in undesired positions. Water sprouts can be "mopped off" with a gloved hand in early summer.
4. Train so that the leader or central trunk is somewhat taller than all side limbs until the tree has attained a height of 8 to 10 feet. At this height,

* For detailed information on pruning, request "Pruning Tree and Small Fruits," by Beach, Frank H., Ohio State University Agricultural Extension Service Bulletin No. 246. 1944.

train the central leader limb into a strong outward growing lateral so that the center is opened subsequently to a bowl shape.

5. Remove limbs which arise on the main side limbs within a foot from the trunk.
6. Remove limbs which grow across the center of the tree in order to keep it reasonably open for light penetration and to facilitate spraying and other operations.
7. Prevent V-crotches where two or more limbs are growing with equal vigor. Select the best located of the limbs and remove or subdue the others by pruning. Limbs which grow downward toward the ground on mature trees are usually weak and undesirable for fruiting. Remove them entirely or prune back to an upward growing lateral (see Figs. 29 and 32).
8. Do not allow prominent side limbs to grow parallel, one above the other, if less than 4 feet apart.
9. Make the pruning cut clean and flush as shown in Figures 29 and 30, never leaving stubs. Stubs will not heal properly; heart rot of the wood occurs sooner or later.
10. Do not permit the tree to become taller than about 20 feet. This can be accomplished as shown in Figure 32 by pruning the upward growing limbs back to strong lateral branches.
11. Remove dead, diseased, and broken branches.

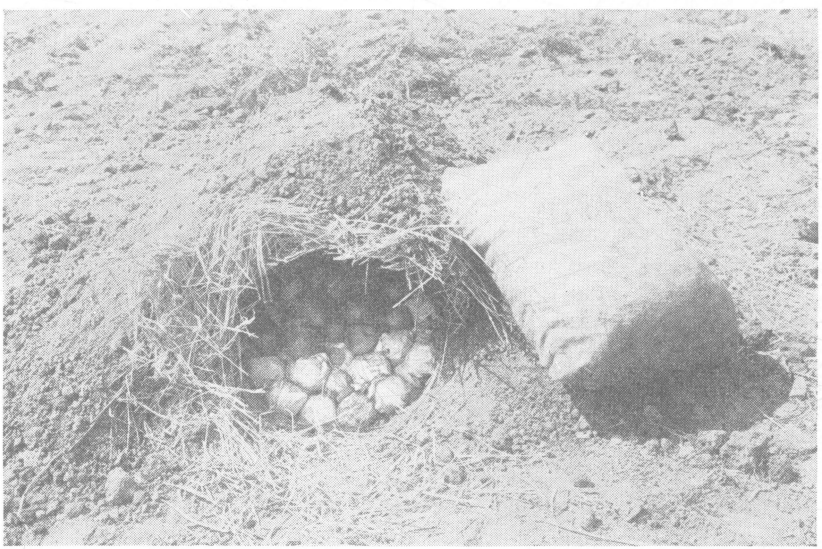

Fig. 33.—This is the initial covering of a horizontal barrel storage pit. Six to 8 inches of straw or leaves are mounded over the barrels. A foot or more of soil is mounded over the straw. A second covering of straw followed by a final covering of earth is given as severe winter weather approaches. A burlap sack filled with straw makes an easily accessible plug for the open end. Straw and earth are mounded over the plug to keep out frost.

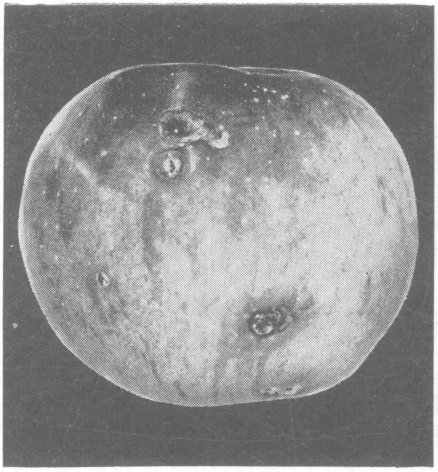

Fig. 34.—Worms of the codling moth have entered this apple on the side. Frequently they enter the apple and pear at the blossom end. The petal-fall spray is important in preventing the latter entrances.

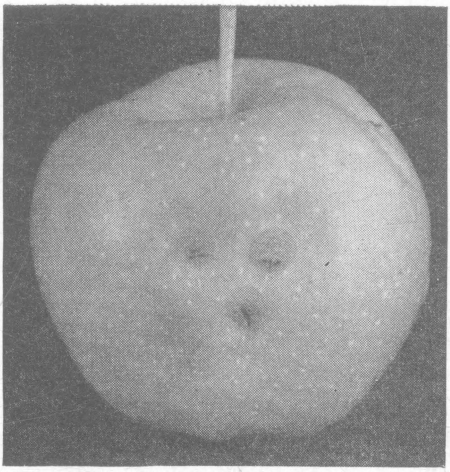

Fig. 35.—The plum curculio feeds and lay its eggs in crescent-shaped punctures in the apple skin. At maturity, the apple shows scars as above. Prompt gathering and disposal of infested drops in early summer helps to control the pest.

Harvesting and Storing.—Each variety has a rather definite growing season in number of days from full bloom to desirable picking maturity. The growing season and days are suggested in the variety description in this bulletin (pages 6 and 7). It is usually desirable to make two or more pickings as the individual fruits reach desirable maturity; first, picking over the tops and outside, particularly the southern and southwestern exposures. The best test is to watch the loosening of apples on the spurs and pick when the stems separate readily from the spur before loss from dropping is serious. Grasp the apple with uniform full hand thumb and finger pressure, twisting and lifting up to "unhinge" the apple stem from the spur. Handle the apples carefully, like eggs, to prevent any bruising, stem punctures, and cuts.

Apples keep best at a constant desirable temperature with high relative humidity to prevent shriveling. Varieties such as McIntosh, Delicious, and Golden Delicious keep best if given immediate cold storage. Storage temperatures of 32 to 35 degrees F. are best for long holds. Apples soften rapidly at temperatures above 50 degrees. Small quantities for immediate use keep best in the refrigerator. Apples are enjoyed most when cold and crisp.

Apples can be stored at home for a reasonable time in an unheated basement room with provision for outside ventilation, or in an unheated room, garage, or outbuilding. Apples will withstand considerable exposure to subfreezing temperatures in unheated rooms if stored in some kind of an insulated container. An example of such a container is to secure a large carton or box into which a smaller carton can be nested with about 6 inches of insulation

material (sawdust, rock wool, cork dust or straw) packed around the sides and under the bottom of the inside container. A pad of insulation material prepared from cloth-covered mineral wool bats* to provide 6 to 8 inches of insulation can be fitted over the top, or, the top can be covered with pieces of old carpeting or woolen clothing. Apples wrapped in tissue or even newspapers and placed in such a carton can be used quite satisfactorily during the late fall and early winter. Apples can be given outside winter storage in covered barrels or boxes placed end to end or side to side and covered with alternate layers of straw and soil, as shown in Figure 33.

Common Insects: *Codling Moth.*—The larva is the common worm infesting apple fruits and is distributed all over Ohio. Damage is observed as worm holes (see Fig. 34) where the spray program has failed to control, and as "stings" where the spray material has killed the worm after some surface feeding. The insect has two broods over most of Ohio and spraying to control both broods is essential to satisfactory control.

Curculio.—The curculio is a grayish-brown snout beetle about ⅛ inch long, which removes small crescent-shaped bites from the fruit while it is still very small. Eggs are laid in many of the punctures and later hatch into grub-like worms. The worms feed within and cause the fruits to drop. The presence of a feeding mark on a small apple or pear causes the fruit to be distorted and misshapen when mature (see Fig. 35).

Apple Maggot.—This is sometimes called "railroad worm," and is a small maggot which bores many small channels irregularly through the flesh of the apple, making it practically worthless. The injury is shown in Figure 36.

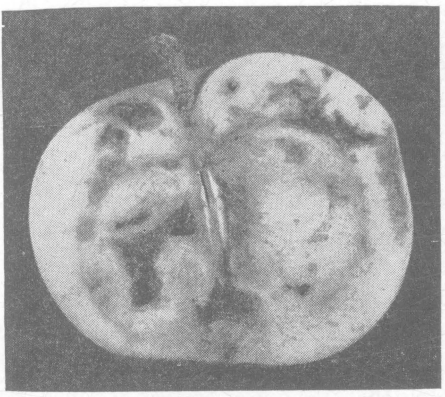

Fig. 36.—Flies of the apple maggot lay eggs in the skin of the fruit. The maggots tunnel at random through the fruit and, hence, are often called "railroad worms."

Red Mites.—These are small red spiders, a fraction of the size of a pinhead, which can be seen moving slowly over the surface of the leaves after midsummer. They are especially troublesome in hot dry weather. The Delicious is very susceptible to their injury. The leaves may assume a bronze cast in late summer as a result of their sucking and rasping injury. Tiny brick red eggs appear on the blossom end of apple and over-winter in clusters in bark crevices on spurs and smaller branches, especially on the under-sides of the branches.

* Mineral wool or similar insulation material in loose or bat form can be obtained at most lumber yards handling home insulation materials.

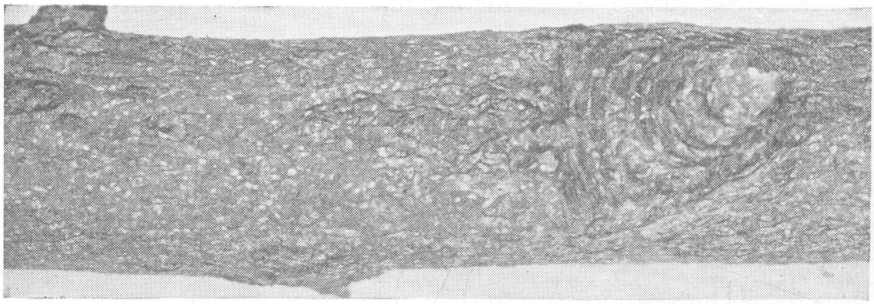

Fig. 37.—San Jose scale attacks a wide variety of fruit plants. Beneath the pinhead white shells, tiny insects suck sap from the wood tissues, causing the plant to wilt and die during the growing season. It can be controlled by dormant oil sprays.

Scale.—This appears as pinhead size grayish-brown scales on the bark under which soft-bodied insects suck sap from the wood tissues. An apple limb encrusted with scale is shown in Figure 37. There are several types of scales, but the effect upon the plant is similar, causing weak growth and dying back of infested branches.

Leafhopper.—This is a small green active insect on the lower surfaces of the leaves. They sometimes increase to large populations in autumn and fly from the tree in swarms when disturbed. Leafhoppers weaken the leaves by removing sap which causes the leaf surface to become whitish-gray, and the fruits to be smaller and poorly flavored and colored.

Aphis.—Aphis are green or rosy soft-bodied insects which appear on the under sides of the leaves where they suck the sap and cause the leaves to curl.

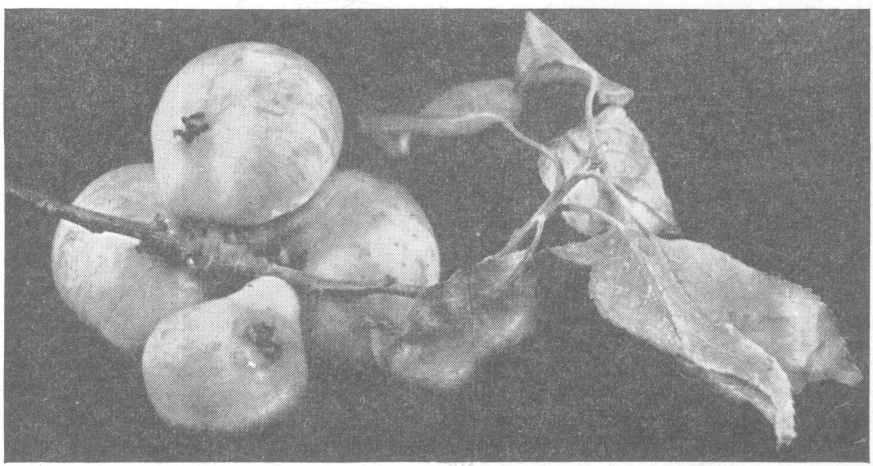

Fig. 38.—Apples stunted by the feedings of rosy aphis on the nearby leaves.

Distorted, small, runty fruit, held several in a cluster, appear as a result of their feeding (see Fig. 38).

Spring Canker Worm (Measuring or looping worms).—These appear about blossoming time and feed voraciously on unsprayed trees especially in western and northeastern Ohio, skeletonizing the leaves, feeding on blossom and young fruits and unless controlled, the foliage turns brown as if swept by fire. Annual application of the petal fall spray as recommended keeps this worm under control. *Tent caterpillars* and *Webworms* during summer months cause somewhat similar injury. They are controlled by the regular arsenical schedule for apples.

Common Diseases.—*Scab* receives more attention in apple spraying than any other disease (see Spray Schedule, page 74). The disease infects in early spring and appears in late spring and summer as bread-mold-like spots on the leaves. Black scabby spots appear on the skin of the fruit and in severe cases, may cause it to become distorted as shown in Fig. 39.

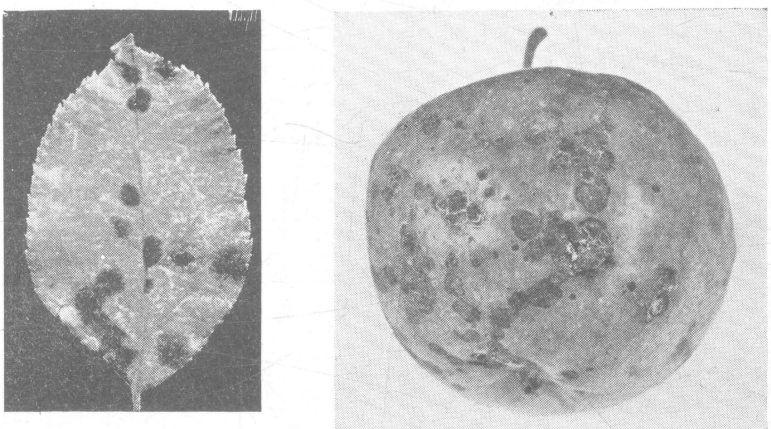

Fig. 39.—Apple scab appears as "bread-mold"-like spots on the leaves (left) and as scabby spots on the fruit (right). Sulfur sprays are effective in its control.

Fire Blight.—Fire blight is a bacterial disease which appears during the spring and early summer. It causes dieback of blossom clusters and of new growth. Blighted branches turn black and dead leaves remain attached to the blighted branch during the summer. Apple, pear, or quince trees which have been induced to grow vigorously by excessive cultivation or nitrogen fertilization are more susceptible to fire blight than those of moderate vigor. Jonathan apple is more susceptible than Stayman Winesap or Delicious.

Black Rot.—This disease appears on the leaves as numerous light to dark brown circular spots. It is often called "frog eye" leaf spot because a dark brown encircling ring gives the spot the appearance of an "eye" (see Fig. 40).

On the fruit it occasionally appears near the blossom end as a firm brown rot with concentric lines of darker brown. It invades dead tissue such as spots of arsenical injury on foliage and is frequently spread from dead or blighted twigs which should be removed in the annual pruning. The sprays recommended for scab control (see spray program, page 74) keep this disease in check.

Blotch.—Blotch appears on the fruit as large brown to black spots with fringed margins in some southern Ohio orchards (see Fig. 41). The disease is controlled with Fermate or Bordeaux post bloom sprays.

Sooty Blotch.—This develops as thin sooty patches or spots in irregular sizes and shapes on any part of the apple.

Brooks Spot.—This disease occurs in the southern third of the state on the fruit, appearing as many small spots (see Fig. 41). The spots are most numerous near the blossom cavity. Bordeaux mixture or Fermate must be used for control, as sulfur sprays are ineffective.

Bitter Rot.—Bitter rot is often serious on the fruit in the southern half of the state. It is not controlled with sulfur spray. Bordeaux or Fermate must be substituted for sulfur in sprays beginning 5 to 6 weeks after petal-fall to secure control. Bitter rot appears as a soft rot on fruit in hot humid weather. Grimes, Jonathan, Golden Delicious are susceptible varieties.

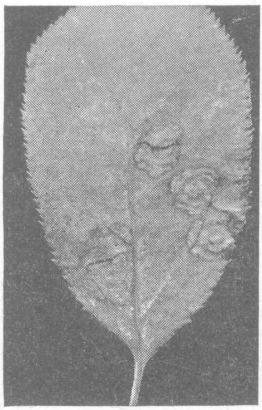

Fig. 40.—Black rot or "frog eye" appears on the leaves as light brown areas with darker concentric rings. The apple may be attacked with a decayed area usually at the blossom end of the fruit.

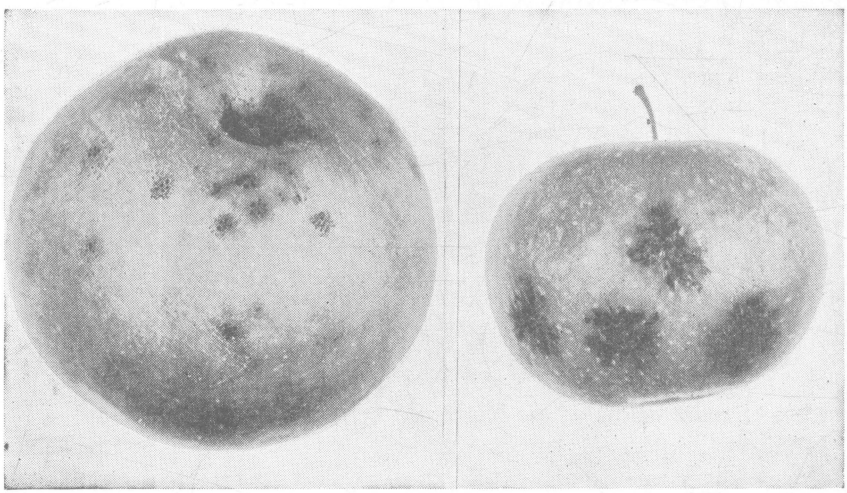

Fig. 41.—Brooks spot (left) and apple blotch (right) are found chiefly in southern sections of Ohio. They are controlled by timely applications of Bordeaux mixture or Fermate.

Pears

The pear, best grown as a dwarf tree in home fruit plantings, can be managed similar to the apple except that less spraying is required and special precautions must be taken to control fire blight, a serious disease which limits pear production in many areas. Blight is most serious on succulent, rapidly growing shoots. So, a soil management and fertilizer program that promotes a firm woody growth is needed for pears. This is best provided by keeping the area from trunk to trunk beneath the trees in a heavy bluegrass sod. Apply lime and superphosphate as needed, but no nitrogen fertilizer or manure should be given, at least with young trees.

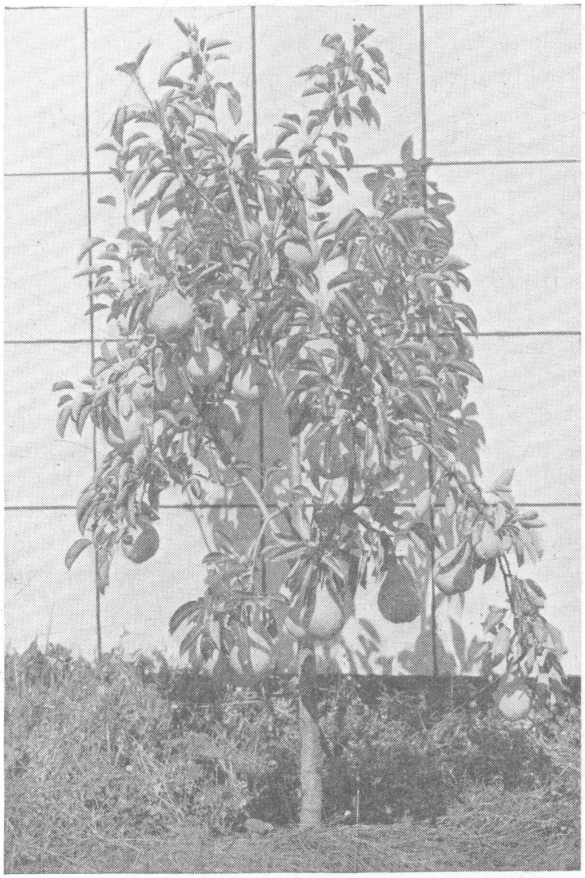

Fig. 42.—A dwarf Bartlett pear tree which is bearing about a peck of pears. The tree is 7 years old. Background shows square feet.

It is disastrous to cultivate under or between pear trees in Ohio, as cultivations promote a soft high-nitrogen wood, susceptible to blight attack. Keep water sprouts and blossoming spurs pruned off the trunk and lower portions of main branches to prevent direct entrance by blight cankers to these areas.

During late spring and early summer, inspect trees every few days for first appearance of blight at tips of terminal shoots, removing blighted branches where they can be spared or at least cutting back to a lateral about 15 inches or more below where blight can be seen.

Promptly disinfect all wounds, also the shears or saw, with a 1-1000 solution of corrosive sublimate (mercuric chloride—1 tablet to 1 pint of water). This solution is poisonous and should be labeled and kept out of reach of children and animals.

Where blight cankers appear on large limbs or trunk, the disease can be checked or killed by painting the area with fire blight canker solution made as follows: To 4 tablespoons of concentrated hydrochloric acid add 1 quart of hot water in an enamel kettle, and in this mixture dissolve 9 pounds of dry zinc chloride powder. Commercial grades of chemicals are satisfactory for this solution and can be secured from a local drug store. Add sufficient red or

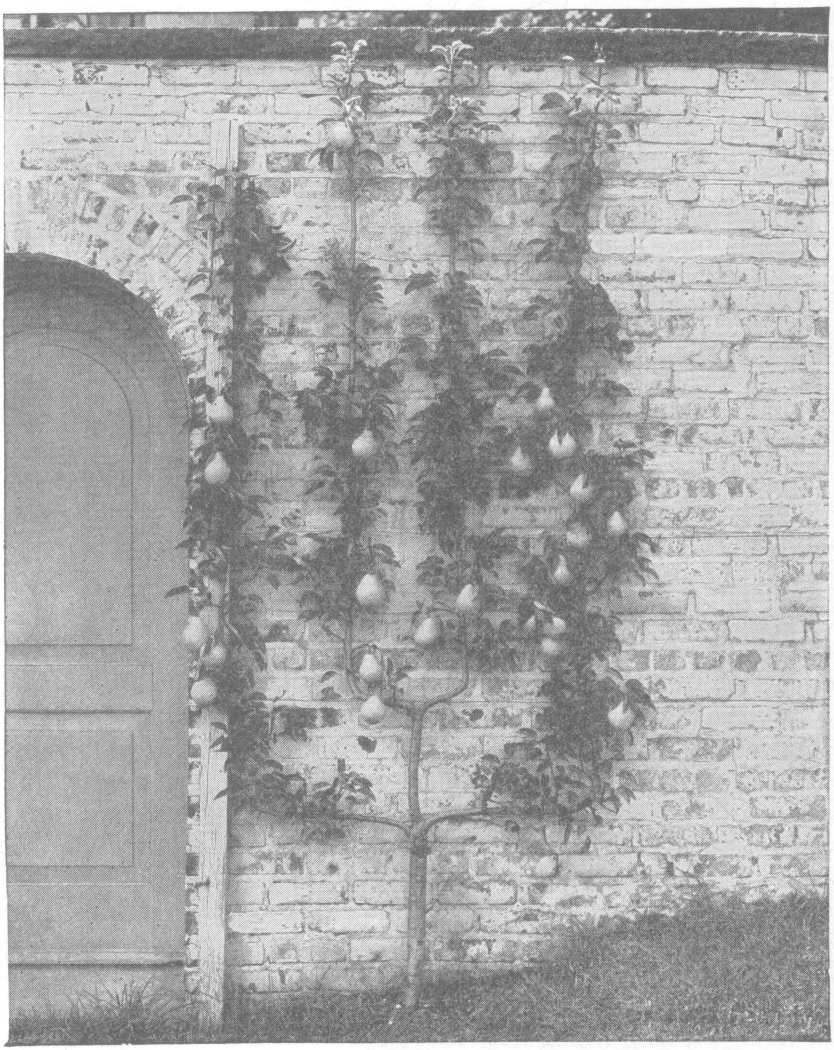

Fig. 43.—An Espalier dwarf pear tree trained against a brick wall. It is safer to train dwarf fruit trees against the north or east wall. South or west exposures may cause the buds to open early and to be killed by late frosts; also, heat from these walls in summer is more intense. This is especially true of the peach or fruits that blossom relatively early in Spring.

blue coloring, using any good dye, so that areas treated can be checked for thorough work. After cooling, pour above solution into 7 pints of denatured alcohol and mix well. Store in tightly stoppered large glass bottles or jugs to prevent evaporation. Apply with small paint brush.

Standard pear trees are most satisfactory if a blight resistant stock such as Old Home or Kieffer is planted and the variety budded or grafted as desirable scaffold limbs become available at a distance of about 15 inches or more from the trunk.

HARVESTING AND STORING.—Pick pears while hard and green, as soon as they attain full size and before the fruit shows yellowing or softening. Handle them carefully to avoid bruises and skin punctures. To ripen for immediate use, subject the pears to a rather constant temperature of about 65°F., such as is commonly found in an unheated basement during the fall. In about a week or thereabouts, the fruit will ripen to full flavor and juiciness with splendid texture. Pears do not ripen satisfactorily in refrigerators which carry a temperature of 40 to 50 degrees. For a long hold, cold storage at 32°F. is satisfactory, and then remove for a short hold to a room at about 65°F. when ripening is desired. A fully ripened pear can be placed in the refrigerator to give it desirable eating condition. Pears which are allowed to become overripe on the tree develop excessive grit cells, are apt to be dry and mealy, and soften too rapidly around the core.

It is essential that pears be harvested when the flesh is hard, crisp and starchy, and ripened off the tree as described above.

DWARF FRUIT TREES

Dwarf apple and pear trees, now offered by many nurseries in the popular varieties, have a real place in the home fruit garden. They bear within a year or two after planting and can be easily sprayed or dusted with hand equipment. The individual fruits on dwarf trees are usually of satisfactory size, color, and eating quality. Dwarf apple trees propagated on Malling IX rootstock are very satisfactory for home plantings as are peas dwarfed by propagating on the Angiers quince rootstock. Where standard apple and pear trees are planted in the home garden, the tres are often too large to spray or dust with hand equipment by the time they reach bearing at 8 to 10 years of age. Hence, timely spraying, essential for the control of scab, worms, and other pests, is often neglected on the standard trees, while it can be easily arranged if dwarf trees are planted. Dwarf trees can be set 8 to 10 feet apart and closer in hedge rows, along a walk or drive, or when given special training.

When planting dwarf trees it is important to have the point of union between the variety and the dwarfing rootstock just above the ground level. If the tree is planted with the union below ground, roots may rise from the base of the desired variety and the tree then will soon become a standard size tree. It is helpful in getting the tree off to a good start to mix wet peat moss

with the soil placed around the roots as advised for planting apple trees (page 32).

The root system of dwarf trees is shallow, and for some time the tree may not be well anchored in the soil. For this reason, some kind of trunk support such as a stake, or, training against a wall or on a trellis is recommended to prevent trees from being blown out of position by the wind. Each spring inspect trees for heaving damage (lifting the tree out of the ground by freezing and thawing) and tramp the soil around the trunk as necessary to keep the tree properly anchored. Where excessive heaving has occurred, it may be necessary to add additional soil around the trunk to cover any exposed roots, but always keep the union above the ground line. A 2- by 2-inch wooden stake or small pipe can be placed in the hole while planting, or it can be driven about 4 inches from the trunk. Secure the trunk to the stake by small screweyes in the trunk at heights of about 15 to 30 inches, running wires from the screweyes to the stake.

Dwarf trees lend themselves well to Espalier (see Fig. 43) or Cordon training on trellises or against walls or buildings. The rather severe pruning needed to train these special patterns does not keep dwarf trees from blossoming and fruiting, whereas such heavy pruning given to train a standard tree would tend to make it unproductive. By pruning in early spring and into early summer as necessary, bending and tying the shoots into desired positions, it is possible to easily train the dwarf trees to any desired pattern. Branches bent and trained during the summer will remain in fixed position as soon as dormant.

Where dwarf trees are grown as specimen trees, encourage low branching with the first branch leaving the trunk about 1 foot above the ground. Relatively little pruning is needed except to give the trees the desired training. It is easy to keep them within any height or spread desired by following the pruning methods recommended for the apple.

Sometimes dwarf trees set too many fruits and require thinning as suggested for the standard apple tree (see page 39) soon after the June drop or about 6 weeks after bloom. Best fruits are grown if the trees are not allowed to overload. It is often desirable with specimen trees to prop any heavily loaded branches before they droop out of position.

Quince

The same procedure can be used for planting the quince as suggested for the apple on page 35. The quince is very susceptible to fire blight, a disease which causes the shoots to turn black in midsummer. To reduce damage from the disease, the tree should be grown in sod with no mulch, and nitrogen fertilizer should be applied very cautiously as previously suggested for pear culture. If the tree is induced to grow vigorously by cultivation or by excessive use of manure or nitrogen fertilizer, it is almost certain to suffer from fire blight.

The quince can be trained as a bush or a tree with relatively little pruning needed. Removal of dead and crossing and interfering limbs is usually sufficient.

Quince fruits are voraciously attacked by the larvae of the Oriental fruit moth. This fruit worm can now be effectively controlled by applying DDT sprays every two weeks beginning when the terminal growth of nearby peach trees show infestation, which is usually about mid-June and continuing through the summer and early fall until complete control is secured. Use 50% DDT wettable powder at the rate of 1 cup in 10 gallons of water.

It is possible also to avoid most of the worm infestation by bagging the individual fruits which grow very clean and attractive in the bags. Small but strong paper bags are placed over the fruiting shoot about 6 weeks after blossoming and held in place by tying the bag securely around the branch or fastening with a paper stapling device or wire paper clip. These bags are allowed to enclose the fruit until harvest time. Light string or rubber bands may allow the bags to become loose and open to insects before the fruit is grown.

Nuts

Planting.—It is unwise to grow nut trees from seed. The quality, hardiness, yield and other characteristics of the seedlings are usually disappointing. Budded or grafted trees of named varieties should be planted whenever possible. Most nurserymen can furnish the established varieties.* Nut trees are difficult to transplant due to a long tap root which is deficient in fibrous roots. Fibrous roots can be increased by severing the tap root 18 inches below the ground surface one year before it is transplanted. Most nut trees from the nursery have received this attention. Special care should be taken to prevent the roots from drying while transplanting. It is more desirable if the trees are moved with a ball of earth. Recommendations for planting young apple trees as described on page 35 are suitable for planting nut trees. Planting in March or April in Ohio is advisable.

Soil Management.—Nut trees will grow satisfactorily in sod. Where possible, improved growth and fruiting can be secured by use of a ring of mulch under the tree. Nuts do better on neutral or alkaline soil, with the exception of the chestnut which prefers an acid soil. Walnuts require a relatively fertile soil, particularly one rich in nitrogen. Strawy manure applied in fall or commercial fertilizer in spring are good sources of fertility. Manure should be kept away from the tree trunks.

Pollination.—Present knowledge indicates that it is good practice with all nut trees to plant together at least two varieties of the same nut.

Pruning.—Under average conditions, nut trees grow satisfactorily without pruning, much the same as shade trees. There should be no harm, however, in training the tree as recommended for the apple on pages 40-44.

Harvesting and Storing.—Leave the nuts on the tree until they fall naturally or with mild shaking. Best quality product of black walnuts is secured

* Contact Dr. G. L. Slate, Secretary, Northern Nut Growers Association, Geneva, New York, for a list of recommended nurserymen carrying nut trees.

when the husk is removed before it turns black. Tramp or beat the nuts out of the husks, wash in water, and spread in a thin layer in the sun to dry. Store the nuts in sacks where it is reasonably dry and cool.

COMMON INSECTS: *Caterpillars,* if numerous, may defoliate certain limbs of the tree in midsummer. Examine the trees frequently and spray as soon as the worms appear, with arsenate of lead, 1 pound in 25 gallons of water. Where facilities are not available for spraying, it is often possible to destroy the worms by collecting them when they gather on the trunk in a mass and shed their skins. Remove and burn the smaller branches upon which they are feeding in groups.

Weevils.—The larvae of weevils may feed upon the nuts of the hickory and chestnut. Destroy all nuts which drop prematurely as a result of weevil feeding.

Codling Moth.—The codling moth attacks the Persian or English walnut. Apply arsenate of lead or DDT in midsummer as recommended for apple orchards, page 74.

COMMON DISEASES.—Nut tree diseases are relatively few. Filberts may be affected by a *blight* which appears as dead or brown spots on the leaves. Remove and burn affected areas as soon as they appear. Walnuts, especially the Thomas variety, may be affected with a *perennial canker.* This can be avoided by keeping the trees thrifty and vigorous. *Chestnut blight* prevents the growing of native chestnuts. Use blight resistant hybrids of the Chinese and Japanese species. If blight appears in these hybrids, cut out and burn the affected branches and treat the cut surfaces with a good antiseptic solution, such as mercuric chloride (poisonous), 1 part in 1000 parts of water (1 tablet to 1 pint).

PEACHES

PLANTING.—Peach trees can be planted in late fall, but early spring planting is preferred. Handle the nursery stock and plant trees as described for apples (page 35), giving immediate planting if possible. Where planting must be delayed, unwrap and heel-in the trees as described for apples on page 16. Trees set in the fall should be pruned in early spring. Immediate pruning should be given spring-planted trees. Where no desirable side branches are available, the tree can be cut back to a whip at about 24 inches above ground. Side branches will develop. With well grown trees, often 3 or 4 side branches can be selected with the lowest about 12 inches and the highest about 24 inches from the ground, each well spaced, vertically, and around the trunk. The trunk is headed back to the upper branch and the side branches cut back to rather short spurs about 4 inches long.

An excellent way to start well grown young trees with caliper of ⅝-inch or more, is to head the trunk at about 36 inches, removing all side branches below 12 inches and cut back all other side branches to stubs of one bud each. In early summer when shoots are 5 to 8 inches long, four or five well spaced,

wide-angled branches can be selected for scaffold limbs and the other shoots removed (see Fig. 44). Peach trees are trained to an open, bowl-shaped tree.

Soil Management and Fertilizers.—Peach trees grow better under cultivation than any other tree fruit. Beginning the first year, a circle about 8 feet in diameter around each tree can be hoed, extending the circle each year to keep it somewhat beyond the branch spread, or the entire area between the trees can be cultivated from early spring until about August 1, after which weeds are allowed to grow and more or less form a cover crop over winter. When trees are cultivated, a better system, however, is to sow an overwintering cover crop, such as rye or domestic ryegrass, after the last cultivation and disk or chop it into the soil *early* the following spring before it starts to joint and shoot.

Before *After*

Fig. 44.—Deshooting is an effective method of establishing strong framework on peach trees. The 1-year tree is cut to 2½ feet at planting time, and the lateral shoots are cut to one to two buds. When shoots are about 5 inches long in May or early June, four or five well distributed ones are selected as shown on the right above (courtesy Ohio Agl. Experiment Station).

Where it is preferred to grow the peach trees in sod, reasonably good growth can be secured if the trees are mulched as described for apples (page 36) or if hoed circles are maintained under the branches. It is desirable to mow the growth between the trees and under the trees in the row in a peach planting about every two weeks until the crop is harvested. This reduces damage to the fruits by "trash" insects (see Fig. 48).

Complete fertilizer, as recommended for apples, can be used to promote growth of desirable grass or cover crops between the trees. It is important to give special attention to adequate nitrogen fertilizer applications beneath the branches as described for apples, page 38. Under cultivation, peach trees can be given about 5 ounces per year of age per tree of sulphate of ammonia, nitrate of soda or cyanamid, or about 3 ounces of ammonium nitrate applied in late fall or early spring. Where cyanamid is used, late fall application is preferred. *For peach trees growing in sod and mulched, the annual rate of applying nitrogen fertilizer should be two or three times the rate used under cultivation.* Use sufficient fertilizer to get the desirable length of annual growth.

Fig. 45.—A 6-year Elberta peach tree which has a strong framework. Fig. 46 shows how the tree should be pruned in March or April.

Fig. 46.—Same tree as shown in Fig. 45 after pruning. Tips of all strong growing branches have been cut back 12 to 24 inches in 2-year wood to a side branch in order to keep tree within a height and width spread of about 13 feet. The center has been opened for light. Lower limbs which tend to droop to the ground with fruit have been removed entirely or to an upward-growing lateral. Dead twigs in center of tree which may harbor disease also have been removed. The amount of wood removed is shown near the ladder. Pruning cuts were scattered along each limb removing about one-third of last year's growth. This improves size and quality of crop and promotes strong new wood renewals over a long length of limb for next year's crop.

Young non-bearing trees should make all the growth that can be properly ripened each year (18 to 36 inches), and with bearing trees plump terminal growth of 12 to 15 inches each year is satisfactory to keep trees in a fruitful condition.

POLLINATION.—Most varieties of peaches are self fruitful. The J. H. Hale, Halberta, Mikado, and Hope Farm varieties require cross-pollination and South Haven or Halehaven are satisfactory cross pollinating varieties.

THINNING.—In favorable years peach trees tend to set an excessive number of fruits. The object of thinning is to improve fruit size and quality and to encourage a tendency to annual bearing by reducing overloads. Overloaded trees grow few peaches to desirable size, with many under 2 inches in diameter. After the natural June drop is over, thin to space the larger and more desirable fruits to average at least 6 inches apart on the twigs. Occasionally opposite fruits can be left where this does not overload that portion of the branch. Small and defective fruits should be removed first. After thinning, many peaches will reach a desirable size of 2 to 3 inches or more in diameter, running about 150 peaches to the bushel. Smaller peaches are wasteful, as the seeds are about the same size in small and large peaches, and the paring waste is heavier. Where additional pruning is needed, undesirable branches can be removed at the time the trees are thinned, thus, speeding up the thinning operation.

PRUNING.—Peach trees grow vigorously and it is therefore necessary to prune them more heavily than other fruits. One-fourth to one-third of the fruiting wood is removed annually. With proper cultural management, a peach tree should attain full size within 6 to 8 years. Train the tree during this period to an open-bowl shape with strong scaffold limb development as shown in Figure 46. Recommendations 1 to 9 on the type of pruning cuts for apples on pages 43-44 may be followed in training the peach.

Since the blossom buds on peach trees are borne only on vigorous 1-year wood, it is important to train the tree from year to year so that it is sufficiently open, particularly in the center, to encourage 1-year spurs and branches to be renewed annually over a long length of limb. Trees should not be allowed to become so dense when in full leaf that they cast a complete circle of shadow under the trees. Pruning should open the tree sufficiently to allow sunlight to strike all leaves and to appear in spots on the ground under the tree. It is very important that peach trees be pruned every year in early spring or early summer. *When given late fall and early winter pruning, loss from winter injury and winter killing is often severe.*

When a peach tree attains a height of about 10 feet, it is desirable to lower the tree by cutting back all main limbs with cut in 2-year old wood at a prominent crotch, preferably to an outward growing lateral, at a height of about 8 feet. The place at which it is cut back is known as the "renewal point" (see Fig. 46). The renewal point for each branch can be maintaned at about the

same location from year to year by annually cutting back to a desirable outward lateral arising near the renewal point. It is important to prune annually to outward growing laterals and to keep the top center open to admit light throughout the tree. Reduce the 1-year twigs, which contain the fruit buds, by at least one-third. This is done by pruning off the more slender twigs, spacing the thicker ones from 4 to 12 inches apart along a branch.

The foregoing recommendations apply when little or no winter killing of buds has occurred. To determine winter killing of buds, cut several of the large fruit buds crosswise in March or April. Blossom buds on the peach are plump as contrasted to narrow pointed buds which are branch or leaf buds. Blossom buds are borne singly on short spurs, and, on more vigorous growths, the buds appear frequently in clusters of three with a plump blossom bud on each side and a narrower leaf bud in the center. If the center of the blossom bud is green, it is alive; if brown, it is dead. If the bud has been killed entirely, it will be dry, shriveled and brown throughout. If many of the buds have been killed, it is advisable to wait until the tree blooms or preferably until after the crop has set before pruning, at which time the tree can be pruned lightly or not at all in order to develop the maximum number of good peaches. Heavier pruning can be performed in later years when the crop is either heavy or has been lost by winter freezing or spring frost damage.

Harvesting and Storing.—Home grown peaches should be left on the tree until they are soft-ripe for eating out of hand, and until they are firm-ripe for canning, freezing, and cooking. There is a remarkable increase in size, color, quality, and flavor of peaches during the last few days they are on the tree. Pick over the trees as the peaches ripen, making two or more pickings. Pick peaches one at a time and handle carefully like eggs to prevent bruising damage. Peaches which are picked green and ripened off the tree are of poor quality, low in sugar and have an undesirable flavor. Firm ripeness is reached with yellow peaches when the ground color of the skin has turned from green to lemon yellow, and for white peaches when ground color has turned to a creamy white and the peach is still firm to full hand pressure.

Peaches are highly perishable and should be placed under refrigeration or in a cool basement as soon after picking as possible. Any surplus should be canned or frozen immediately. The average life of a firm-ripe peach at room temperature is 2 to 3 days. Under refrigeration, firm-ripe peaches may be kept from 2 to 4 weeks.

Common Insects.—Most common cause of death of backyard peach trees is the *peach tree borer* which feeds on the wood and bark near the ground surface (see Fig. 47). The *curculio,* as described for the apple on page 45, accounts for many crescent-shaped stings and for the small white grub-like worm near the seed in mid-summer. The *Oriental fruit moth* bores in the tip of growing shoots in June and July causing them to droop, turn brown, and die. Later generations of the larvae enter the fruit and develop into small

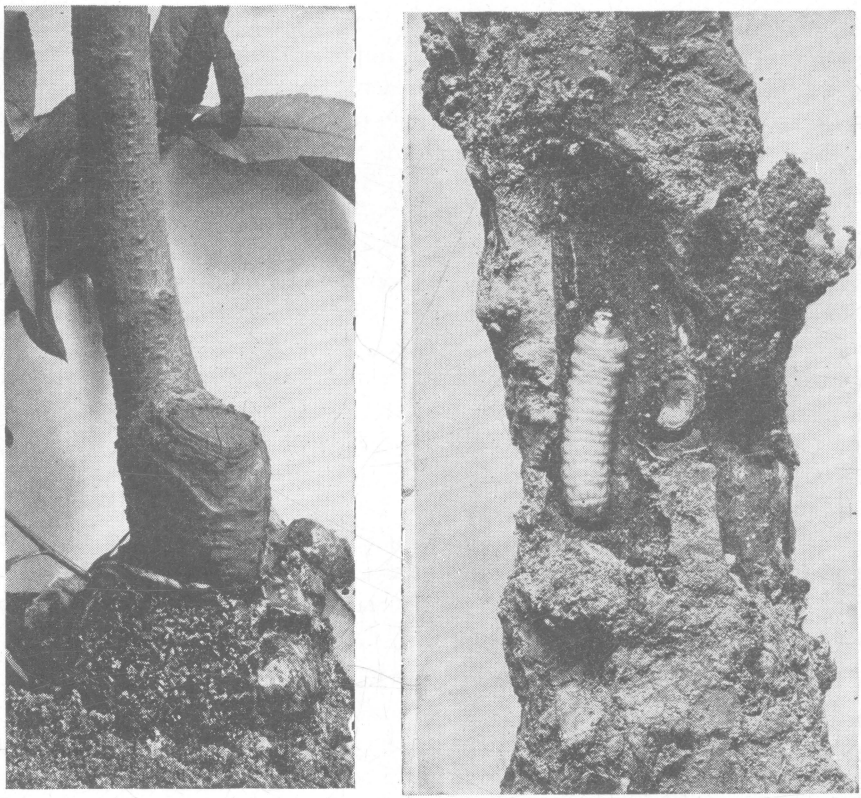

Fig. 47.—The peach tree borer is a serious enemy of young and mature peach trees. The larva bores in the bark and outer sapwood causing gum to exude near the ground surface.

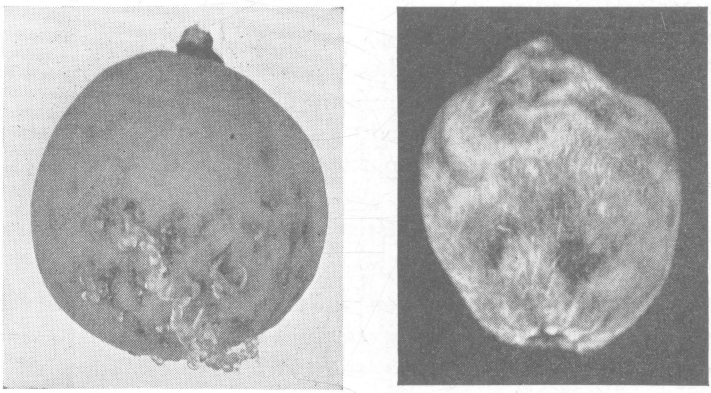

Fig. 48.—(*Left*) This injury is caused in June by the green soldier bug or the "stink bug." (*Right*) Sucking injury by the tarnished plant bug causes runty peaches with a dimpled effect over the surface. These insects are less troublesome if the ground is cultivated or if the grass is kept short.

pinkish larvae which tunnel through the flesh of the peach, causing gum exudation followed by decay. Varieties maturing with, or later than, Elberta are most seriously affected. A well-timed DDT spray gives some control. *"Stink" bugs and tarnished plant bugs* pierce the small peaches and cause the fruits to exude gum and become dimpled as shown in Fig. 48. (See pages 76 and 77.)

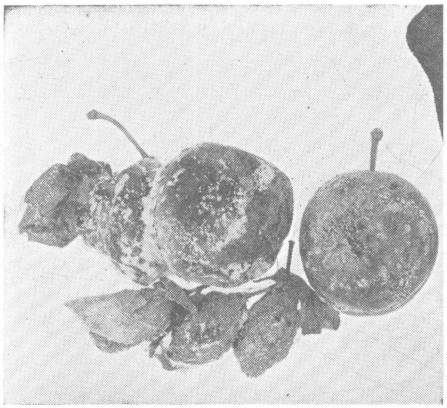

Fig. 49.—Brown rot disease is a major problem with the plum (above), peach, and cherry, especially a few weeks before harvest. It affects fruits and shoots. Some fruits may remain attached to tree as mummies over winter. They should be removed and burned. It can be controlled by sulphur as spray or dust.

COMMON DISEASES.—*Brown rot* is particularly troublesome when the fruits begin to ripen. Infected fruits turn brown and develop a velvety chocolate brown fungus growth over the skin (see Fig. 49). The decayed fruit may drop prematurely, but often hangs to the twig and dries intact, remaining over winter. The disease is particularly troublesome in rainy humid weather. A sanitary measure, aside from spraying, is to remove infected fruits as soon as they appear, and burn or bury them. *Leaf Curl* appears early in the growing season distorting and curling the leaves which take on a mixture of bright colors and drop prematurely, reducing the crop and weakening the

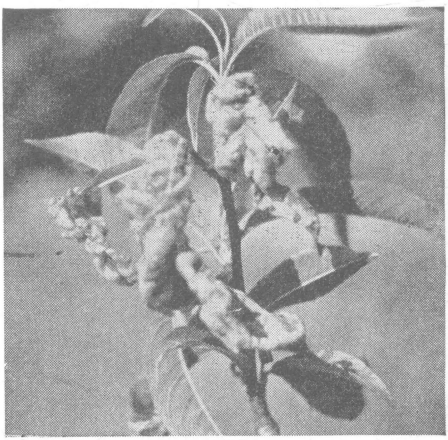

Fig. 50.—Peach leaf curl appears early in the growing season as thickened curled leaves which exhibit many bright colors. It is controlled by dormant sulphur or copper sprays.

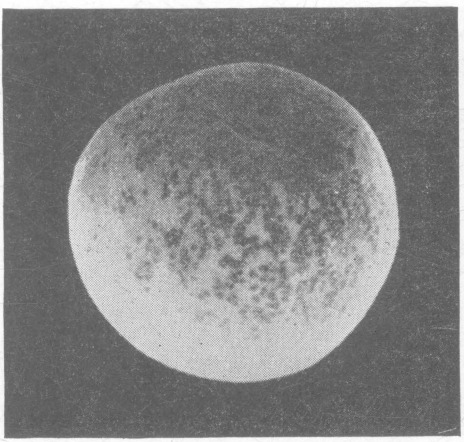

Fig. 51.—Peach scab appears as numerous small black or brown spots on the skin. Sulphur sprays control it.

tree. (See Fig. 50). *Scab* appears as many brownish-black spots on the skin of the peach, which mars its appearance. (See Fig. 51.) *Arsenical injury* may appear from spraying with arsenate of lead unless lime and zinc sulfate are used with it. (See page 76.) Leaves may turn purplish-red with marginal burning with dead areas falling out of the leaves, giving a shot-hole appearonce. Oozing and discoloring of the young wood and fruit may occur. Old bark where injured becomes rough and scaly. Follow closely the spray schedule recommended for peaches. *Do not use apple sprays on peaches.* Apple spray mixtures are apt to cause serious arsenical injury on peach trees.

Cherries and Plums

Planting.—Sour cherries and plums can be planted either in the late fall or early spring. Sweet cherry trees are rather difficult to transplant and succeed best if dug and transplanted in early spring. If thoroughly mature they may be transplanted in late fall. Sweet cherries are often injured over winter by drying in nursery storage cellars. When planting, place the crook in the trunk near the base of the tree about 2 inches below the ground line. The crook indicates where the variety was budded on the seedling rootstock in the nursery. Planting recommendations as outlined for the apple, on page 35, apply for cherries and plums. Cherries require well drained soils. Sweet cherries are very exacting and succeed best where subsoils are well aerated and deeply drained. Plums are tolerant to a wider range of soil types and drainage conditions.

Complaints are frequent of backyard cherry trees dying in late spring and early summer. This is often due to planting the trees on poorly drained soils. Where the soil is known to be of a heavy clay type, better results can be secured by building a mound of fertile top soil 2½ to 3 feet high and about 15 feet in diameter, and planting the tree at the top center of the mound.

Fig. 52.—Sweet cherry trees (left) were in bloom about 10 days before the sour cherries (right) blossomed. Hence, sour cherry trees will not provide cross-pollination for sweet cherry trees. If sweet cherries are desired use Windsor for one variety to provide cross-pollination for other sweet cherry varieties.

Soil Management and Fertilizers.—Cherries and plums respond best to cultivation and cover cropping as recommended for peaches. However, they may be grown in sod, preferably with supplementary mulch as described for apples, page 36. Nitrogen fertilizer can be applied beneath the branches in late fall or early spring. Where trees are cultivated, the suggested rate of application per tree per year of age is 2½ ounces ammonium nitrate, 4 ounces of sulphate of ammonia or cyanamid, or 5 ounces of nitrate of soda. Where ground is in sod, it is usually desirable to double the above rate of nitrogen application.

Pollination.—Sour cherries and European plums are self-fruitful. Many varieties of sweet cherries are self-unfruitful and, in addition, fail to pollinate each other. It is recommended that Windsor be included in the planting to insure cross-pollination of other sweet cherry varieties. Varieties of Japanese plums are usually self-unfruitful, so it is important to plant two or more

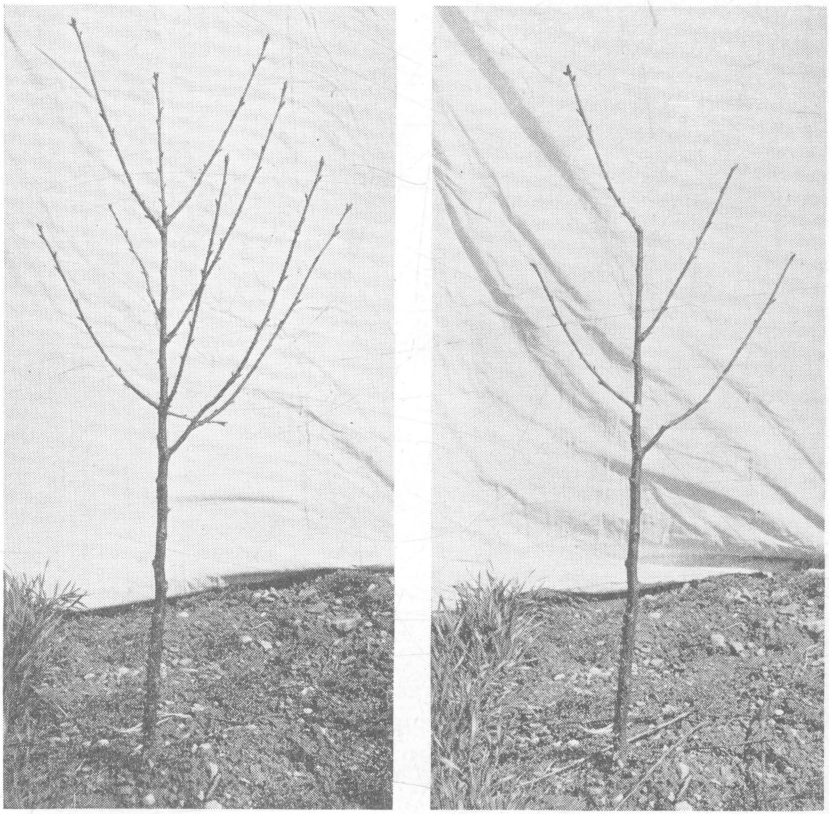

Fig. 53.—A 1-year sour cherry before and after pruning at planting time. Three wide-angle branches have been left which are well spaced around the leader. In later pruning, it may be possible to eliminate or subdue by pruning one or more of these and use branches starting higher on the trunk for wider scafford spacing.

varieties in the same planting. Cross-pollination does not occur between sweet and sour cherries or between Japanese and European plums because sweet cherries and Japanese plums bloom a week to ten days before sour cherries and European plums (see Fig. 52).

THINNING.—It is desirable to thin plums after the June drop to space the larger and better fruits about three inches apart. When grown in clusters close together, spraying is less effective and brown rot is apt to spread from fruit to fruit. Proper thinning improves size, color, and quality and is recommended for all species of plums. Cherries do not require thinning.

PRUNING.—Train young cherry and plum trees as recommended for apples except that somewhat closer spacing of scaffolds is desirable for sour cherries and plums (see Figs. 53 and 54).

Keep sharp crotches from developing at scaffold unions; this requires considerable attention in training sweet cherry trees. Bark and wood are very susceptible to winter injury and killing in the vicinity of narrow crotches.

To secure well balanced growth of framework limbs, space the scaffolds around the trunk so that no two arise close together on the same side or on opposite sides of the trunk at the same level. As trees become dense, prune to keep them reasonably open by removing large branches that cross the tree. Remove dead, weak, slow growing, underhanging wood. When the trees have reached a desirable height (15 to 20 feet) cut back upright branches to strong outward growing laterals at the desired height. It is important to get from 10 to 18 inches of terminal growth each year to keep sour cherries in good fruitful condition. Sweet cherries require less thinning-out pruning than sour cherries or plums.

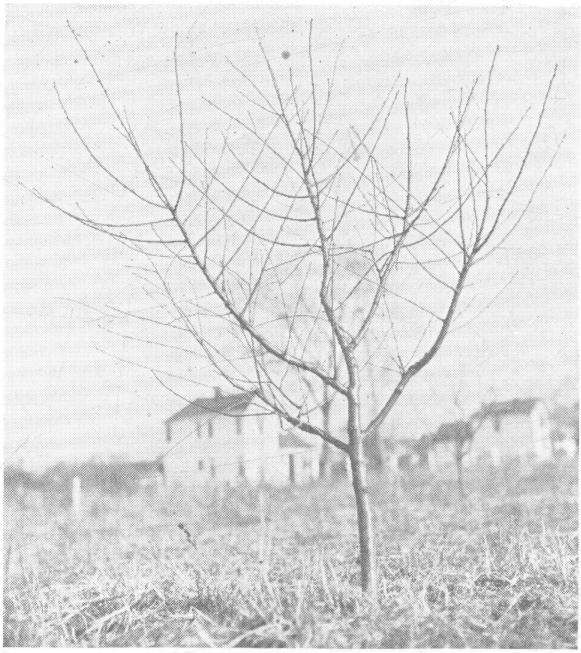

Fig. 54.—A young sour cherry tree with scaffold limbs well spaced up and down and around the central trunk.

Harvesting and Storing.—Cherries and plums for immediate use in canning or freezing may be picked without stems. If the fruit cannot be used for two or three days, it is best to pick with stems attached. Cherries and plums develop best flavor if allowed to remain on the tree until fully ripened. Size, quality, and flavor improve rapidly during the last few days the fruit hangs on the tree. Place the fruit in the shade immediately after picking and, if it

Fig. 55.—A well trained Stanley prune tree with the central trunk larger than any lateral branch. The five or six strong lateral branches have wide-angled crotches and are well spaced up and down and around the central trunk.

cannot be used at once, it can be given a short hold in a cool basement and can be kept over a longer period in a refrigerator or in cold storage at 32°F.

Common Insects.—Curculio is the small white grublike worm in the fruit at picking time. The adult beetle causes small crescent-shaped scars on young fruits (see Fig. 56) which results in many of the half-grown plums dropping to the ground. The *cherry maggot* is a small white white legless maggot which burrows around the pit at first, but later through the flesh. In advanced stages,

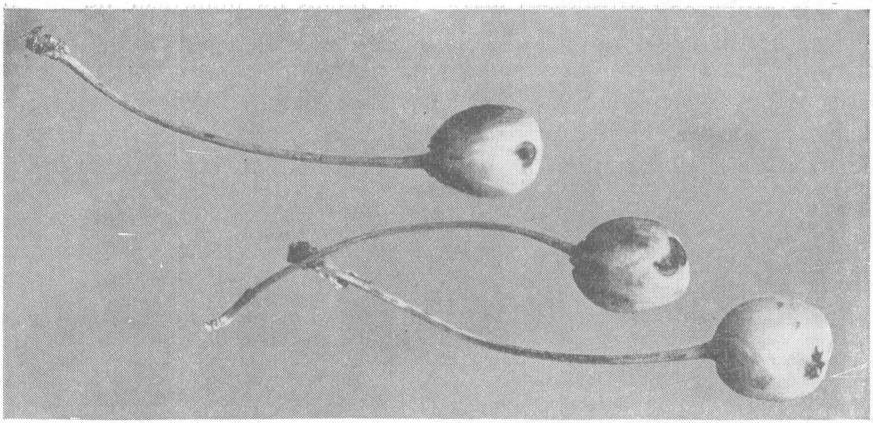

Fig. 56.—Plum curculio attacks a wide variety of fruits. This injury, on cherry, is characterized by a crescent-shaped bite in which an egg has been laid. This insect accounts for most worms in cherries.

the fruit shows sunken spots. When full grown, the maggot eats its way out of the fruit, falls to the ground and enters the resting stage in the soil. The *cherry aphis* is a green or black soft-bodied insect which sucks sap near the shoot tips, causing the leaves to curl. Injury is limited to the sweet cherries.

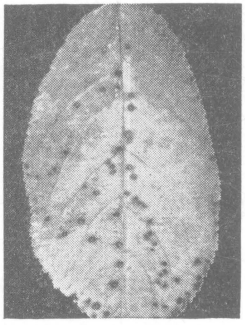

Fig. 57. — Cherry leaf spot is a fungous disease which causes the leaves to develop brownish-black spots, turn yellow, and fall prematurely. Sulfur fungicides are effective in its control.

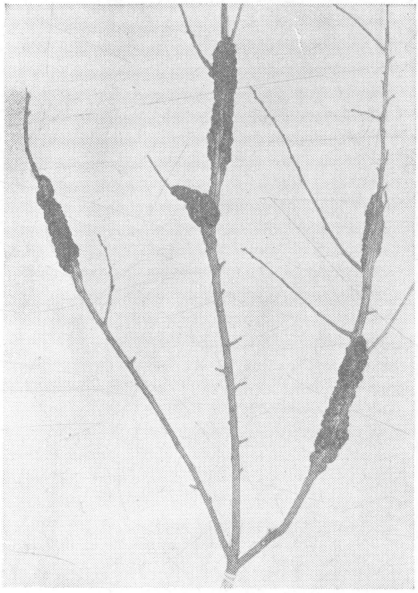

Fig. 58.—Black knot of plums may appear on neglected trees. It is a fungus and should be removed and burned. Moderately vigorous trees are fairly resistant.

The *cherry slug* is a slimy dirty-brown slug-like insect about ½ inch long which skeletonizes the foliage, leaving only the framework of the veins.

Common Diseases.—*Cherry leaf spot* appears as brownish black spots on the leaves about midseason (see Fig. 57). The leaves later turn yellow and drop prematurely. This early loss of leaves weakens the tree for subsequent crops. A leaf spot of plums is similar in appearance.

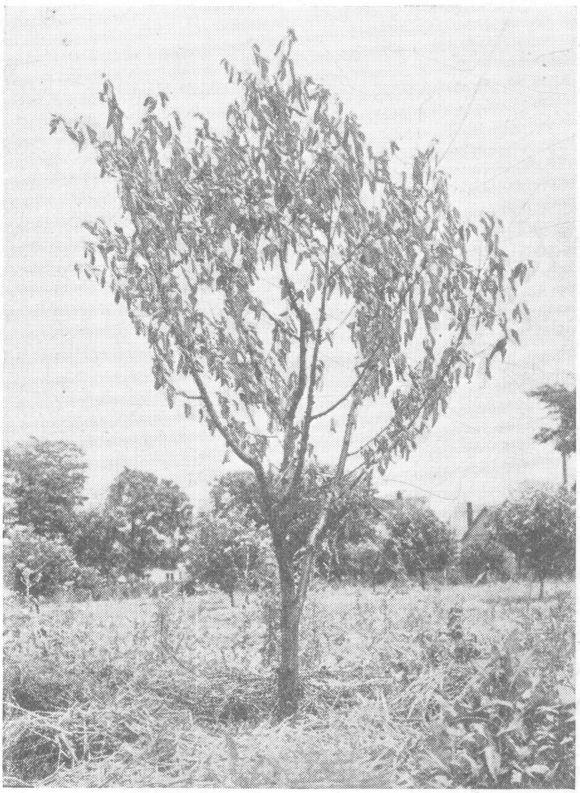

Fig. 59.—A 3-year sour cherry tree dying in June as a result of a heavy, poorly drained soil. Cherries and peaches are particularly susceptible to this condition while pears, plums, and certain varieties of apple are somewhat more resistant.

Brown rot is common for cherries and plums. The description is given under peaches on page 61.

Black knot of plums may appear on neglected trees. It is a fungus, and should be removed and burned. See pages 76, 77 and 78 for cherry and plum spray and dust schedules.

Birds in Cherries.—The robin and starling may destroy a large portion of the crop on a single tree or a few trees. Injury on an individual tree may be prevented by placing mosquito netting over the tree. Pieces of shiny tin hung in the trees so that they dangle with the wind, may frighten the birds. A cat kept in the vicinity of the tree may be helpful.

Planting a Russian Mulberry tree near the cherry trees attracts the birds to these fruits and away from the ripening cherries. Early ripening varieties of cherries, especially sweet cherries, are fed upon by birds more than varieties ripening in midseason. With sour cherries Early Richmond is damaged more than Montmorency. With sweet cherries an early variety such as Seneca is more apt to be destroyed than Windsor, ripening later. A late yellow sweet cherry such as Gold is seldom eaten in quantity by birds.

Dying of Fruit Trees

In a normal fruit tree, there is a physiological balance between top and root growth. Water and mineral nutrients move upward from the soil chiefly in the sapwood, and plant food for growth of all parts of the tree, manufactured in the leaves, moves downward mainly through the inner bark. Any injury to the tree by weather, gnawing animals, borers, foliage insects or diseases, chemicals, suffocation of roots by waterlogging of soils (see Fig. 59), and mechanical or other injuries may interfere with this normal growth balance and injure or kill the tree.

When trees are injured or growth is unsatisfactory, strive to discover and correct the cause and follow with the good cultural practices designed to correct deficiencies and restore normal growth.

Newly transplanted trees sometimes fail to start, or leaf out feebly and die This may be due to improper handling of the nursery stock, such as digging the trees in fall before the wood is mature, drying or freezing of the stock in storage cellars, in transit, or after arrival at the destination, improper fumigation of the nursery stock, or other causes.

Winter injury exacts a severe toll particularly with the more tender fruits, such as sweet cherries, peaches, nectarines, apricots, and boysenberries. Wood that has been winter injured shows browning of inner bark and sapwood. Injured trees may leaf out feebly with short shoots and small yellowish-green leaves, and the entire tree may die by early summer. If the tree is not weakened severely, spring applications of nitrogen fertilizer may help recovery.

Where trees have been planted over tight, poorly drained subsoil, a large number of roots may be injured or killed by suffocation and the weakened tree becomes susceptible to winter killing. This often occurs with peaches and cherries, frequently with sweet cherries. When wood is forced to grow late into the fall due to excessive nitrogen fertilizer (especially manures such as poultry), the wood does not mature properly and branches may die back and winter injured areas on the bark may appear near the crown of the tree. Or, the injury may appear in the vicinity of narrow scaffold crotches, as the wood in these areas seems to mature last in the fall. The southwest exposure of trunks and larger limbs may show sunscald or winter injuries due to widely fluctuating temperatures on this exposure.

Trees damaged by defoliating insects or diseases, such as canker worm, cherry leaf spot, apple scab, peach leaf curl, or borers may become unproductive and weakened to the point that winter injury results in death.

Trees that have been extensively injured or girdled by gnawing of mice, rabbits or woodchucks need prompt attention to repair of damage by bridge grafting in early spring. However, if the damage has existed for more than a year and the tree shows definite weakening, it is doubtful if the tree can be saved. Bridge grafting should be done in March or April.

Control of Insects and Diseases

By
T. H Parks, Extension Entomologist
and
T. H. King, Extension Plant Pathologist

The equipment for controlling insects and diseases in the home fruit garden need not be expensive. One has the choice of spraying or dusting. Each method has its merits and the choice will depend upon the preference of the individual and the equipment available.

Spraying.—Some advantages of spraying are:

(1) Material adheres better to fruit and foliage and fewer applications are necessary to protect crops.

(2) Spraying can be done any time during the day when trees are dry under weather conditions such as a light wind, which makes dusting impractical.

(3) Material costs are lower with sprays and there is less waste in application.

(4) A number of insects and diseases, such as scale, red mite and peach leaf curl, can be controlled only by spraying. There is no satisfactory dusting program for grapes.

Dusting.—Dusting has its advantages, too. They are:

(1) Less time and labor are required to apply dusts.

(2) There is less danger of injuring foliage and fruit with dust.

(3) Available water supply is not needed.

Whether spraying, dusting, or using a combination of both methods, good equipment should be provided, and *timeliness with thoroughness of application* is essential if control is to be secured. Successful control of most pests involves a knowledge of what insects and diseases may attack, when and how they attack, and making applications ahead of infections or infestations to prevent damage.

Spraying

For treating a few small plants, an atomizer type of hand sprayer is useful. One should not try to use it beyond its capacity. For the average home fruit garden where large trees are not included, the knapsack sprayer, compressed

air hand sprayer, and bucket pump are the common types used. If large fruit trees are included, it may be necessary to secure a barrel pump or a small gasoline or electric power sprayer, with a tank of 14 to 20 or more gallons capacity, as shown in Figure 61. Power sprayers are relatively expensive, however ($100 to $250) and unless there are vegetables, shade trees, shrubbery, or other spray

Fig. 60.—A small gasoline or electric power sprayer holding 10 to 15 gallons can be used for spraying a few large trees in addition to the smaller fruit plants, shrubs, and vegetables. A light-weight extension rod and adequate hose is recommended.

work in addition to the home fruit garden, it may not be profitable to invest this much money for spraying equipment.

So-called "cartridges," carrying the insecticide or fungicide, and to be placed in a specially constructed chamber in the lawn hose line, are not satisfactory for spraying fruit trees. Low water pressure and unevenness of concentration as the insecticide or fungicide is worn away, limit the use of cartridges.

One should consider the area to be covered, frequency of spraying needed, labor supply available, and the simplicity of construction of the sprayer in purchasing equipment. From Table II determine the approximate quantity of spray needed to cover the plants and secure equipment of sufficient capacity to cover the plants in about a day. Where the planting requires applications of about 500 gallons or more it is desirable to use power equipment. The amount of spray material required for a single application on trees in full foliage is given in the following table:

TABLE II.—AMOUNT OF SPRAY REQUIRED PER TREE (Gallons per Application)

CROP*	2-3 years	5 years	10 years	12 years	15 years	21-35 years
	Gallons	*Gallons*	*Gallons*	*Gallons*	*Gallons*	*Gallons*
Apples	½	1½	6	8	12–18	18–35
Peaches	¾	3	5½	6	7	
Cherries (sour)	½	1½	5	6	7	
Cherries (sweet)	½	2	7	8	10	15
Pears	½	1½	5	6	7	15–20
Plums and Prunes	¼	1½	4	5	8	
Currants and Gooseberries	¼	½				

* Dwarf apple and pear trees require up to about 1 gallon for a mature tree. Per 100 feet of row, dormant brambles require approximately 3 gallons; grapes in leaf, 6 gallons; and strawberries, 3 gallons.

The nozzle is a very important part of the sprayer. It should break the liquid into a fine mist and also deliver the proper volume. On types larger than the hand atomizer, a small vermorel or angle disk nozzle should be used. Power equipment should have at least 20 feet of hose and a light-weight extension rod long enough to reach the tops of trees while the operator is standing on the ground (see Fig. 60).

Beginning at planting time, foliage must be protected from damaging insects and diseases, and, as the plants reach bearing age, it is essential that the pests attacking the fruit be controlled by *timely thorough spraying*. The spray schedules for fruit plants on pages 74 to 79 should be followed closely. Young trees and dwarf trees can be managed easily with hand equipment. For this reason dwarf trees are much preferred in the home planting.

The spray should be applied when the trees are dry in order to wet all bark or leaf surfaces. When trees are in leaf, pay especial attention to thorough application in the tops and centers of the trees, which are the most difficult to cover.

DUSTING

Good hand dusters which deliver the material in dust form can be purchased for amounts ranging from $4 to $30, depending upon the capacity

desired. These are of the plunger, fan, and bellow types (see Figs. 61 and 62). In making a selection, one should choose a duster that will be well balanced on the operator's body and easy to operate. This will relieve fatigue and insures more frequent use. It should be as free as possible from complicated mechanism. The purchaser should see that the delivery tube is fitted with a metal guide or deflector to force the dust against the underside of leaves when necessary. The better dusters are fitted with a cutoff to regulate the amount of dust that flows in to the delivery tube. Even distribution of the dust is an essential requirement. Select relatively quiet periods of the day for dusting, such as in the evening or early morning. Dusts adhere best if applied when foliage and fruit are wet with dew or immediately after a heavy rain or during a light rain or fog. If the weather is particularly dry, the foliage can be conveniently wetted with a garden hose. The amount of dust required for a single application is as follows:

TABLE III.—QUANTITY OF DUST TO USE PER PLANT AT EACH APPLICATION

CROP*	AGE OF TREES IN YEARS				
	1 to 5	5 to 10	10 to 15	15 to 20	20 and over
	Ounces	*Ounces*	*Ounces*	*Pounds*	*Pounds*
Apples	2	4–8	16	1½–3	3–4
Cherries	2	4	8–12	1	1–1½
Peaches	2	4–8	8	½	½
Pears	2	4–8	8–12	1	1
Plums and Prunes	2	4	8–12	1	1

* Amount of dust required for *currants, gooseberries* and *grapes* is about 2 ounces per plant.

The dusts should be weighed carefully before mixing. Small amounts can be mixed in a closed drum, or a can which is half-filled with the materials and rotated, or shaken for a short period of time. It is necessary either to fit a coarse screen diagonally inside the container through which the dust falls when rotating, or to have several medium-sized stones inside to facilitate the movement of the dust when the vessel is rotating. Mixed dusts can be carried over from one application to the next if kept in a dry place.

Spray Schedules[1]

The following spray schedules contain recommendations for controlling the major insects and diseases in the home fruit garden. The spray materials control, in addition to the more or less regular troubles, others of minor importance which may appear from time to time. In case an insect or disease should appear for which no description or recommendation is given in this bulletin, it is suggested that you send a description with samples of the injury to your County Agricultural Agent.

For brief descriptions of the insect or disease and the injury, refer to the chapter on the fruit in question, given in another section of this bulletin.

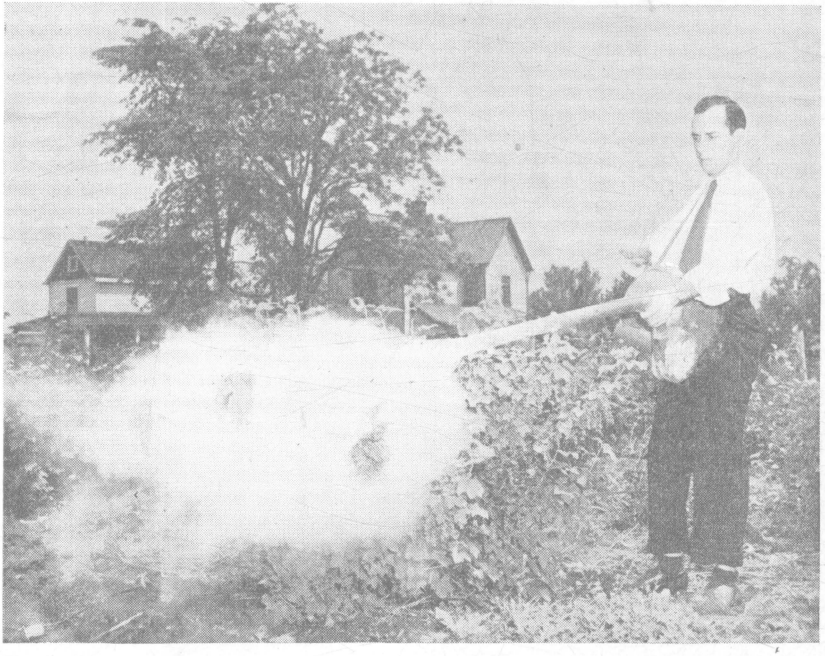

Fig. 61.—The fan-type of duster, driven by a crank, gives an even and plentiful flow of dust. It is particularly effective in dusting for currant worm and it can be used for peach, cherry, and other backyard trees.

[1] Spray service broadcasts are prepared primarily for commercial orchardists, but the information given may aid the owner of a home orchard to time the sprays more effectively. The County Agricultural Agent can advise regarding radio stations, day and time. More detailed spray information is contained in "Spraying Program and Pest Control for Fruit Crops," The Ohio State University Agricultural Extension Service Bul. 128, 1947, which is written for commercial growers.

SPRAYING PROGRAM FOR APPLES* AND PEARS

No	Time to apply	Materials	Amount to use in			Diseases and insects to be controlled	Remarks
			1 gal	5 gal	50 gal		
1	When trees are dormant (no leaves)	Oil Emulsion (3%)	½ c.	2½ c	1½ gal.	Scale Red Mite	Necessary only when these pests are troublesome
2	Just before bloom	Dry lime-sulfur	4 T.	1 c.	2½ lb	Scab	Very important for apple scab
3	When petals have fallen	Wettable sulfur Lead arsenate	5 T. 3 T.	1½ c. ½ c.	4 lb. 1½ lb	Scab, Curculio Codling moth Canker worm	Very important
** 4	3 weeks after petal fall	*Same as above*	*Same as above*	*Same as above*	*Same as above*	*Same as above*	Important for codling moth
5	5-6 weeks after petal fall	*Same as above*	*Same as above*	*Same as above*	*Same as above*	Apple maggot Codling moth Scab (see note)	☞ In these sprays the following abbreviations are used: T = 1 level tablespoon C = measuring cup or ½ pint t = 1 level teaspoon
*** 6	9-10 weeks after petal fall	*Same as above*	*Same as above*	*Same as above*	*Same as above*	*Same as above*	

* For early ripening varieties of apples sprays No 5 and 6 are not needed

** In the southern half of Ohio where the apple diseases Brooks Spot, Blotch, and Bitter Rot are a problem, substitute Fermate or commercial Bordeaux Mixture at manufacturer's directions or homemade Bordeaux prepared as directed by your County Agricultural Agent, for wettable sulfur in 4, 5 and 6 Fermate may be used elsewhere in Ohio if desirable and will control apple scab as effectively as sulfur

*** No. 6 is not usually needed on pears

If codling moth (wormy apples) has been a problem, add 50% DDT powder to the ingredients in sprays 5 and 6 and apply another spray of DDT alone about 2 weeks after No 6 The amount of DDT powder to use is approximately one half the amount of lead arsenate recommended

DUSTING PROGRAM FOR APPLES AND PEARS

Time of Application	*Insect or Disease*[1]	*Dust Mixture to Use* (Given in units of 20 lbs Use about 4 lbs per full-grown apple tree.)
Prebloom	Apple scab	Apply straight dusting sulfur as given for peaches and plums. Apply at least three times between delayed dormant and bloom. If canker-worms, known as measuring worms, are present in the pink stage of the bloom, use the dust mixture given under "petal-fall."
Just after petals have fallen	Apple scab Codling moth Curculio	17 lbs. fine dusting sulfur and 3 lbs. lead arsenate *Do not apply lead arsenate during bloom*
10 days later	Apple scab Codling moth Curculio	Same as petal-fall
2 weeks later[1]	Same	Same[1]
2 weeks later[2]	Same	Same[2]
2 weeks later	Same	Same
2 weeks later	Same	Same

For early varieties of apples the last three dust applications will NOT be needed

[1] This program will not control scale insects, aphids or red mite for which liquid applications are necessary A dormant spray as given on Page 74 had better be applied where a dusting program is to be followed. Bitter rot, blotch and Brooks spot, restricted largely to Southern Ohio, are NOT controlled by either sulfur dusts or sprays. For these diseases, Fermate or copper dust at the manufacturer's directions for dusting should be substituted for sulfur beginning 3 weeks after petal-fall.

[2] One and one-half pounds of 50% DDT powder can be added to the above dust mixture in this and the following applications, if codling moth worms have been serious in fruits

SPRAYING PROGRAM FOR PEACHES AND PLUMS

No	Time to apply	Materials	Amount to use in			Diseases and insects to be controlled	Remarks
			1 gal	5 gal	50 gal		
1	When trees are dormant	Dry lime-sulfur	½ c	2½ c	12 lbs	Peach leaf curl	If scale is present double amount of dry lime-sulfur
2	Just before bloom	Wettable sulfur	6 T.	1½ c	4 lbs	Brown rot	Important for curculio control
3	Shuck-fall or one week after petals have fallen	Lead arsenate Zinc sulfate Wettable sulfur Lime	2 T 5 T 5 T. 5 T.	½ c 1¼ c 1¼ c 1½ c	1 lb 2 lbs. 3 lbs 3 lbs.	Curculio Brown rot Scab	
4	Two weeks after No. 3	Wettable sulfur	5 T.	1¼ c	3 lbs	Brown rot Scab	Important for disease control
5	Five weeks after No. 4	Wettable sulfur	5 T.	1¼ c	3 lbs.	Brown rot, scab	
6	Three weeks before harvest	DDT (50%)* Wettable sulfur	2 T 5 T	½ c 1¼ c	1 lb. 3 lbs	Oriental moth Brown rot Scab	☞ In these sprays the following abbreviations are used: T = 1 level tablespoon C = measuring cup or ½ pint t = 1 level teaspoon
7	Five days before picking on peaches	Wettable sulfur	5 T	1¼ c	3 lbs	Brown rot	

Peach tree borers are most serious pests of peaches They tunnel between the bark and the wood of the crown, trunk, and upper roots of the tree Peach tree borers are controlled by applying crystalline paradichlorobenzene (PDB) in a ring around the trunk about October 1 Three fourths to 1 ounce of crystals to a well grown tree is placed in a ring two inches from the base of the tree and covered with soil Care must be taken not to place the chemical in contact with the tree DO NOT USE THIS TREATMENT ON TREES LESS THAN THREE YEARS OLD Where only one or two trees are infested the borers may be removed with a wire or knife

* DDT may be omitted on plums and also on peach trees where injury from Oriental fruit moth has not been serious

DUSTING PROGRAM FOR PEACHES AND PLUMS

	Time of Application	*Insect or Disease*	*Dust Mixture to Use*
1	Dormant	Scale Red mite Leaf curl (peach)	No dust satisfactory. (See liquid spray program)
2	Just before bloom	Brown rot	18 lbs. dusting sulfur 2 lbs. lime
3	Shuck-fall (When shucks are being pushed from little fruits)	Curculio Brown rot Scab	12 lbs. dusting sulfur 4 lbs. lime 4 lbs. lead arsenate
4	2 weeks later	Brown rot* Curculio Scab	12-4-4 as above
5	5 weeks later	Scab, Brown rot	18 lbs. dusting sulfur 2 lbs. lime
6	7 days before harvest	Brown rot Leaf curl (plum) Scab	18 lbs. dusting sulfur 2 lbs. lime

* If heavy rains occur, extra dust applications should be made to keep brown rot in check.

Fig. 62.—The bellows type duster is convenient for dusting the larger fruit plants. It balances easily on the back of the operator. The bellows is pumped with the right hand while the dusting pipe is manipulated with the left. By standing on a stool or ladder it is possible to reach higher in a tree, if necessary.

SPRAYING PROGRAM FOR SWEET AND SOUR CHERRIES

No.	Time to apply	Materials	Amount to use in			Diseases and insects to be controlled	Remarks
			1 gal.	5 gal.	50 gal.		
1	When buds are in delayed dormant (sweet cherries only)	Dry lime-sulfur Nicotine sulfate	½ c. 1 t.	2½ c. 1 T.	12 lb. ½ pt.	Black cherry aphis	Use only when black cherry aphis is troublesome
2	One week after petal-fall	**Wettable sulfur** Lead arsenate Lime	5 T. 2 T. 5 T.	1¼ c. ½ c. 1½ c.	3 lb. 1 lb. 3 lb.	Curculio Leaf spot Brown rot Slugs	Important for curculio and leaf spot
3	Four weeks after petal fall	Wettable sulfur Lead arsenate Lime	5 T. 2 T. 5 T.	1¼ c. ½ c. 1½ c.	3 lb. 1 lb. 3 lb.	Leaf spot Maggot Slugs	Important for leaf spot
4	Spray sweet cherries after each rain period until harvest	Wettable sulfur	5 T.	1¼ c.	3 lb.	Brown rot Leaf spot	Very important if brown rot is hard to control
5	Immediately after harvest	Wettable sulfur	5 T.	1¼ c.	3 lb.	Leaf spot	Necessary only if leaf spot is a problem

NOTE.—Sour cherries can often be grown successfully without spraying or dusting or with fewer applications than recommended above. Past experience should determine the program to be followed.

DUSTING PROGRAM FOR CHERRIES

Time of Application	*Insect or Disease*	*Dust Mixture to Use* (Use about 2 lbs. per full-grown cherry, peach or plum tree.)
Shuck-fall (When shucks are being pushed from little fruits)	Leaf spot Brown rot Curculio Slug	16 lbs. sulfur 4 lbs. lead arsenate
2 weeks after shuck-fall	Leaf spot Brown rot Curculio	Same as above
When fruits are beginning to color	Leaf spot Brown rot	18 lbs. sulfur 2 lbs. lime

(See note under spraying program for cherries.)

SPRAYING PROGRAM FOR GRAPES*

No.	Time to Apply	Materials and Amounts to Use	Diseases and Insects to be controlled	Remarks
1 2	When new growth is ½ to ¾ inch long Repeat when shoots are 10 to 12 inches long before blossoming	Fermate ½ cup per 5 gals. water *or* Commercial or homemade Bordeaux** plus ½ cup soapchips to 5 gals. spray	Black rot	Important for black rot
	When grape fruits are size of small shot. (About 1 wk. after bloom)	***Fermate ½ cup plus ½ cup of DDT per 5 gals. of spray	Black rot Berry Moth Leafhoppers Mildew***	Very necessary for berry moth. Important for black rot
4	3 weeks later	Same as No. 3	Same as above	Same as above
5	30 days before harvest	Same as No. 3	Same as above	Same as above

* There is no dusting program known to be effective against grape insects and diseases.

** Home-made bordeaux mixture can be prepared as follows: 3 ounces copper sulfate (bluestone) and 4½ ounces hydrated lime per 5 gallons of water. The copper sulfate should be dissolved first in about half the water and then poured into the lime and water-mixture made with the other half of the water. The whole mixture should be thoroughly agitated and then poured into the spray tank.

*** If mildew is a problem Bordeaux must be substituted for Fermate. Follow the manufacturer's recommendations for mixing commercially prepared Bordeaux.

Sprays 4 and 5 are required only if black rot or berry moth is especially severe.

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American Fruit Grower, Cleveland, Ohio—Figures 2 and 4.

The New York Agricultural Experiment Station—Figures 7 and 24 (right photo).

The Monroe Nursery, Monroe, Michigan—Figures 3 and 5.

Henry Leuthardt Nursery, Port Chester, New York (electro plate was courtesy of the Monroe Nursery, Monroe, Michigan)—Figure 43.

The United States Department of Agriculture, Bureau of Entomology—Figure 49.

Other Available Extension Bulletins

Bulletin No.

104. Home Canning for Better Family Meals.

123. Home Storage of Fruits and Vegetables.

128. Spraying Program for Fruit.

246. Pruning Tree and Small Fruits.

224. Food Preservation by Freezing.

250. Grape Growing in Ohio.